ROCK PRODUCTS

AUGUST, 1948 | THE INDUSTRY'S RECOGNIZED AUTHORITY | VOL. 51, No. 8

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"WE HEAR..."

August, 1948

Despite increasing costs in home building, value and amount of new construction being put in place this year is also on the increase. United Industrial Associates, Inc., figures a home that cost $4,599 in 1939 (national average) was up to $10,769 by March of this year with additional rises figured for April. Yet the Department of Labor estimates builders started 90,000 new homes in April -- up 29 per cent from March and 34 per cent above a year ago. Value of new construction put in place in April, including public works, was $1,269,000,000, or 9 per cent ahead of March and an increase of 37 per cent over a year earlier. Construction contractors added 163,000 workers in April.

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Production of steel in the United States during 1947 proceeded at an average of 93 per cent of rated capacity to mark an increase of 60 per cent over 1939, steel officials report.

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Employers can sign a contract with the union in their plant calling for a checkoff of union assessments and initiation fees as well as periodic dues of members. The Justice Department has decided that the Taft-Hartley Act is not violated by such checkoff clauses in union contracts, particularly where a union constitution provides that these assessments and fees are included in "membership dues."

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Supplies of natural rubber will exceed manufacturers' needs by the end of the year, the Rubber Study Group predicts.

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Use of engineers in their most effective capacity is being urged by Engineers Joint Council in connection with the draft law. Only a relatively small number are needed in combat service during war, the Council pointed out in a statement to the House Committee on Armed Services, suggesting a special committee be established to examine all deferment cases involving engineers, and to establish procedures for most effective use, based on the training and experience of the individual.

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Broadcast applications of liming material to cotton soil have proven decidedly beneficial to cotton, according to the Georgia Agricultural Experiment Station. In some cases sufficient application was made to overcome acidity resulting from mixed fertilizers, and in others, additional amounts are being used to correct acidity of the unfertilized soil.

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The Senate has passed a measure providing $708,586,000 for flood control and navigation improvements.

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A mineral wool cement base roofing developed by Petroleos Mexicanos for petroleum storage tanks in the tropical Gulf Coast area is expected to outlast metal roofs four times and costs no more, company officials state. Reinforced with 12-gage wire mesh,the roof has high insulating qualities, meets requirements for strength, and has ability to withstand tropical weather and associated tendencies to excessive expansion and contraction.

Recent Census Bureau surveys on housing show that 3,445,000 households are in need of major repairs such as replacement of floors, roofs, plaster, walls or foundations.

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An employer cannot place unreasonable restrictions on visits by union organizers to employes living on company property. A National Labor Relations Board finding that organizers have a right to visit such workers, within limits, was upheld recently by a circuit court of appeals, when the court found it wrong for a company to limit organizers to one contact a week with workers, and restrict that visit to the company recreation hall.

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On the subject of truck weights, South Carolina legislature has completed action on a bill allowing 68,350-lb. maximum weights provided truck axles are spaced in accordance with state standards. Multiple axles are common on commercial vehicles, making pavement wear much less than might be expected from a vehicle's total weight.

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An increase of 8 percent in volume of production during the coming year was predicted for the fertilizer industry by Maurice H. Lockwood, president of the National Fertilizer Association, at the 23rd annual convention in June.

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A survey indicates that there will have to be more airport and runway construction close to municipal areas for personal and company-owned airplanes many of which are coming into use by companies in the construction industry. The planes are being used to speed delivery of replacement parts to a job, for rapid inspections of job progress, and to cover projects spread over a wide territory.

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Nearly all remaining war-surplus machinery and industrial equipment which formerly was offered for sale at fixed prices now will be offered on a competitive bid basis, the War Assets Administration announced, with priority rights being recognized.

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Standardized and simplified specifications and building codes is the goal of a new organization, the Construction Specifications Institute, Inc., formed in Washington. In addition to maintaining a clearing-house of unbiased technical information on specifications for the fabrication and installation of constructions materials and equipment, the institute will study new materials and processes developed during the war to use as substitutes or improvements on costlier and scarce materials.

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Railway freight car production should be stepped up to 14,000 cars per month at present and should hit 16,000 cars per month by January, according to ODT Director J. Monroe Johnson, if the industry expects to reach its 10,000-car average monthly production goal.

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Limestone may soon find another use, this time as a base for synthetic textiles. The oolitic limestone belt of Indiana, which contains stone of high calcium content important in the production of textiles, should be the site of a number of synthetic textile mills within the next five years, William G. Riley, president of the Indiana Limestone Co., has predicted, stating that a research laboratory for this purpose is now being set up at his company.

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Quarry operators planning to install new signs should see that they are large, easy to read, and contain adequate information to direct customers to their location, if the signs are to be of the greatest benefit. Recently new reflecting signs have been put in use by rock products producers so that these advertisements may also be seen at night.

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Capital expenditure in Canada, covering new buildings, new machinery and repairs, is expected to reach an all-time high of $2,800,000,000 during this year, it is reported.

THE EDITORS

★ ★ ★ Editor's Page

Cement Industry Seeks to Increase Production from Existing Plants

PRODUCERS of ready-mixed concrete, concrete products, aggregates, and all the other industries that use cement or depend upon the availability of that basic construction material, have a keen interest in activities of the portland cement industry at this time. As their concern is the availability of cement and prices that will prevail, we believe articles in this issue outlining steps being taken to bring cement supply in line with demand, will interest others than cement manufacturers.

Economics of Plant Expansion

All records for shipments of portland cement will be broken this year, with a volume probably slightly in excess of 200,000,000 bbl. The fact that this year is the first since World War I when real demand has actually exceeded supply is significant, and it is one of the guiding influences in determining to what extent plant capacity increases will be undertaken. Should history be repeated and an over-expansion in plants again be brought about, as happened in the 1920's, the result could well prove disastrous to individual companies.

In the period between the two great wars, the industry found that it could break even when operating at 40 to 60 percent of capacity, but as in many other industries, the break even point is very high today and production must closely approach capacity in order to realize ordinary profits. When demand slackens, how rapidly and to what extent will operating costs decline in proportion? Will the relatively high fixed operating and replacement costs, and the labor costs, continue to account for a disproportionate share of total unit cost? Very likely the answer is yes, to that number one question in the minds of management.

Whether or not the volume of cement required the past year or two represents a temporary condition and whether or not the demand is to remain at a permanently higher level than hitherto are other considerations that influence expansion plans.

Not so many years ago it cost $2.50 or $3.00 per bbl. of annual capacity to build a cement plant; today the cost is around $6, exclusive of land and other property. When combined with high operating costs, the question becomes whether or not the earning potential of new capital investment is sufficient to warrant expansion. Funds set aside for depreciation of a new plant must be twice the fraction carried on the books for old plants, which would be a competitive factor in the establishment of prices. Older plants were built when a dollar bought a dollar's worth of equipment. It is reasonable, of course, that allowances for depreciation in all plants should be based upon replacement cost rather than original cost, now that money has turned out to be worth only half what it was expected to be worth at the time installations were made.

Everything points to discouragements to risk taking at this time insofar as big plant expansion programs are concerned, except under unusual circumstances. At best the portland cement industry, like the aggregates industries, is in a risky business. Its success as a business depends upon the construction industry, localized booms and depressions, transportation hazards and a host of other variables. Yet, the industry must operate on narrow profit margins. And to top it all off we now have enforcement of the Federal Trade Commission order at hand which prohibits basing point pricing and the absorption of freight to meet competition and which, ultimately, when supply overtakes demand, may require the building of new plants or at least distributing facilities even in the face of hazardous risk-taking conditions.

Increasing Plant Production

The portland cement industry believes that cement shortages generally will not prevail for long (there are, however, certain areas in desperate need), and very few new plants as such are being built. As many industries are doing, new expansion as such is being deferred, which is a healthy business policy. Rather than a surge of plant construction activity, expansion and further modernization will come gradually as needs require.

Millions of dollars, meanwhile, are being spent to increase output and to improve operating efficiency in existing plants which will be reflected in a more plentiful supply of cement and, in the long run, favorable prices, the F.T.C. permitting.

Bringing into balance the capacities of various mill departments in itself will make available hundreds of thousands of additional barrels of cement annually. Successful methods of reducing interruptions to kiln operation, caused by slag rings, which incidentally have become more serious with the use of the poor quality coal now available, have a very substantial effect on output. It is on operating problems such as these that the industry is concentrating effort.

Bror Nordberg

Rocky's NOTES

Nathan C. Rockwood

Portland Cement Research

ALTHOUGH WE HAVE used for reference and have found it profitable reading, we recall that we haven't reviewed and recommended to our readers, the very best record of research on portland cement—"The Chemistry of Portland Cement,"* by DR. ROBERT H. BOGUE, research director, Portland Cement Association Fellowship, National Bureau of Standards. While written primarily for technical readers versed in chemistry, physical chemistry, and for petrographers, X-ray experts, etc., lay readers will find it, in many places, interesting and instructive. True, much of the contents has already appeared in print in the progress reports of the Fellowship, but it has been difficult for most of us to inter-relate and weigh the significance of the material as published piece-meal.

Dr. Bogue has done a splendid job of bringing all this material together in proper sequence and in recasting and digesting it, so that, if the reader absorbs some of it, he may feel up-to-date on the whole field. The chapter on the manufacture of portland cement is brief but well written to cover essentials. As probably all familiar with hydraulic cements know, the chief differences between modern portland cement and its predecessors are in the lime content and whether or not it is "combined" with the other mineral ingredients. Dr. Bogue disposes of this problem thus: "The proper lime content is limited due to the low early strength produced when the lime is too low, and unsoundness when it is too high. The old cements were lower in lime than the modern cements, but the strength developed by them, more especially the early strength, was lower also. In order to increase the strength it was necessary to raise the lime content, or grind finer, or both. But higher temperatures are required to burn the high-lime mixtures. There is no advantage in adding the extra lime unless it is brought into combination with the other constituents."

Keystone of Modern Progress

That brief quotation, in our thinking, is the trend of modern portland cement manufacture in a nutshell—more lime, finer grinding, harder burning. Most of the rest of the book is devoted to scientific methods for determining what manner of artificial mineral compound is produced and why. There is an excellent historical resumé in which the author gives the essentials of many theories and speculations on the nature of portland cement. This seems to have been done without partiality; in fact, the reader wishes Dr. Bogue had expressed his own opinion of the value of some of these theories. It is apparent, of course, that while all portland cement clinkers contain certain mineral combinations which can be identified by various methods, there are actually no two samples of clinker, either from the same plant, or different plants, which are identical in mineral composition; and it would seem that the mineral composition is more important to the desired properties of a cement than chemical composition.

The difficulty in identical duplication of clinker arises from the fact that no two lots of raw material are ever identical; and, as Dr. Bogue says in his chapter on heat treatment, referring to the conversion of raw material to clinker in the kiln, "the entire cycle is the very heart of every cement plant." Yet these cement plant "hearts" vary as much as one human heart varies from another.

Much space is devoted to the long controversies and speculations as to the principal constituents of portland cement clinker. These seem to have been resolved to the satisfaction of cement researchers; and indeed in the United States are so well established that purchasers set specific limits on these constituents. Yet the exact amounts are fixed in manufacture not only by the analysis of the raw materials, the length and degree of heat treatment, but by the rate of clinker cooling and subsequent handling.

Hydration of Cements

The hydration of portland cement is treated just as comprehensively as the research on clinker; and, of course, the chemistry and the end products of cement hydration are as complex and difficult of accurate analysis as those of clinker formation. Here, again Dr. Bogue gives us an impartial resumé of various investigations, theories and speculations. The main difficulty, apparently, is that lime (CaO), silica (SiO_2) and water enter into an endless number of temporary combinations, so far as the proportions of each are concerned, and it can not be determined with accuracy what effect the minor constituents of the hydrated cements may have in determining these proportions, or how permanent the lime-silica combinations are under the varying conditions.

By studying the separate systems of lime, silica and water, and lime, alumina and water, and lime, iron oxide and water, and in conjunction with each other, various conclusions have been drawn as to the constitution of hydrated cement, and yet this study leaves us with an uncertainty as to what it really is, and as to why "standard" cements behave so differently. Our own opinion is that too much stress has been placed on the *chemistry* of cement and not enough on its physical aspects, such as gradation of particle size. We know that cements of similar chemical composition vary widely in their mortar and concrete making properties, but we seldom have helpful comparisons of their particle size gradations.

Why "Standard" Cements?

It seems we can not escape the conclusion that nearly all research on cements, in this country at least, has been directed toward an attempt to standardize the raw materials, processing, and the final product, even though the possibility of eliminating all the variables is admittedly out of the question. Aside from a natural desire to produce a "standard" product for competitive reasons, why should a cement manufacturer always try to reconstitute raw materials and make processing conform to set standards when perhaps, by disregarding such standards and using his raw materials to best advantage and adapting his processing to them, he might make a better cement?

Having studied some of the early works on hydraulic limes and natural cements, we are convinced that the pioneer manufacturers were not far afield when they used what were termed "try kilns"—small experimental shaft kilns—with which to experiment on samples of raw materials and trial burns, in order to arrive at a process by trial and error, which made the best cement, taking all factors into consideration. If more present research were devoted to using local raw materials to their best possible advantage, and adapting the burning and grinding processes to the particular product made, we might have more satisfactory cements for some purposes. And, probably, we might end up with more practicable knowledge of what makes some cements better than others.

*Reinhold Publishing Corporation, New York City, 1947, price $10.

Mr. Edward H. Frazee, president of Intercity Quarries, is sold on the New Holland Model 3030 Double Impeller Breaker and the quality product delivered by Dual Impact Action. He says, "Bottlenecks in crushing were over for us the day we installed our New Holland 3030 Breaker . . . we have given up the idea of trying to feed this machine to capacity. The City Engineers of Kansas City have declared this stone superior to other stone crushed here and have awarded us contracts on this basis. You can identify this stone immediately. No slivers, flat discs or odd shapes, nothing but cubical in the six sizes of commercial stone we make.

"We highly recommend this New Holland crusher to those who want high capacities at low operation and maintenance costs."

Learn more about the advantages of Dual Impact Action and its profit-building possibilities. Write for the illustrated catalog which shows why New Holland Double Impeller Breakers produce more . . . with less power!

Ask your New Holland distributor to show you "The New Stone Age", a color film of the 3030 Breaker in action. Brings you up-to-the-minute on your business in twenty minutes.

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NEW HOLLAND Breakers
DOUBLE IMPELLER

the Personal Side of the news

Association President

GEORGE G. SMITH, vice-president and a director of the Texas Construction Material Co., Houston, Texas, has been elected president of the Association of Former Students. Mr. Smith is president of the Texas Crushed Stone, Sand and Gravel Association, vice-chairman of the Military Affairs Committee of the Houston Chamber of Commerce, director of the Texas Good Roads Association, and member of the Army-Navy Association, Veterans' Council, Reserve Officers Association, and the Society of American Military Engineers. He served during World War II as a member of the General Staff Corps in the office of the chief of staff with the rank of colonel, a commission he now holds permanently in the Corps of Engineers Reserve.

Sales Manager

JOHN W. BROWN, Dallas, Texas, has been appointed general sales manager of National Gypsum Co., Buffalo, N. Y., and JAMES J. RYAN, Kenmore, N. Y., has been appointed to the newly created position of general commodity manager, according to Dean D. Crandell, vice-president in charge of dealer sales. Mr. Brown has been with the company since 1935, serving as sales manager of the Southwest area since 1941. Earlier he was employed by United Brick and Tile Co. and Universal Gypsum and Lime Co. Mr. Ryan joined the company in 1934.

Officers Reelected

HENRY J. KAISER has been reëlected president and director of Permanente Cement Co., Oakland, Calif. Also reelected were E. E. Trefethem, Jr., as vice-president and director; E. H. Heller, vice-president and director; Carl R. Olson, vice-president and general manager; G. G. Sherwood, treasurer and secretary; Paul E. Rogers, controller; L. S. Corey, H. A. Dick, H. W. Morrison and Gilbert J. Shea, directors.

Receives Thompson Award

W. C. HANNA, chief chemist and chemical engineer, California Portland Cement Co., Colton, Calif., received the seventh Sanford E. Thompson Award of the American Society for Testing Materials for his paper on "Unfavorable Chemical Reactions of Aggregates in Concrete and a Suggested Corrective," published in the 1947 *Proceedings* of the Society. The presentation took place June 25 at the Detroit, Mich., convention of the A.S.T.M., and was made by Sanford E. Thompson, himself, the dean of concrete engineers. The Award was established in 1938 by Committee C-9 on Concrete and Concrete Aggregates as an annual token of recognition to the author or authors of a paper of outstanding merit on concrete and concrete aggregates.

N.L.A. Secretary Retires

ROMA MEDFORD TURPEN has retired as secretary and assistant treasurer of the National Lime Association after many years of faithful service to

Roma Medford Turpen

the Association and the lime industry. She is leaving to devote all of her time to keeping house and raising a family, the first member of which is expected in the near future. Mrs. Turpen was made assistant secretary of the Association in 1934 and has been the editor of its Safety Bulletin for several years. She was born in Washington, D. C., and has an LL.B. degree from Washington College of Law.

Advertising Managers

STEPHEN F. TUCKER has been appointed advertising manager of gypsum and metal products for the National Gypsum Co., Buffalo, N. Y. John J. Hickey has been made advertising manager for paint and insulation board; Frederick C. Egloff, advertising manager for acoustical products; and David A. White, Jr., manager of public relations.

Project Engineer

LEON D. HOLDEN has been appointed as project engineer by the Lehigh Portland Cement Co., Allentown, Penn. Mr. Holden formerly was director of the Cement, Lime and Allied Plants Division of Vulcan Iron Works. He served 18 years with the Lehigh Co. before leaving in 1942 to do war work with the DuPont Co. and Chicago Bridge & Iron Works.

Heads A.R.B.A. Committee

HENRY AARON, senior civil engineer with the Paving and Soils Division, Civil Aeronautics Administration, has been appointed chairman of the new committee on Lime-Soil Stabilization of the American Road Builders Association. Mr. Aaron is a graduate of George Washington University with a degree in civil engineering and is well acquainted with soil research. For more than 20 years, he was with the Public Roads Administration concentrating on research, design and construction in conection with soils and soil stabilization, and for two years was assigned by P.R.A. as technical advisor to the Argentine government in Buenos Aires. At present, Mr. Aaron's work is concerned with the development of standards in design and construction to be used by field offices of consulting engineers and airport sponsors. Members of the committee will represent interests in Washington, D. C., Pennsylvania, Virginia, Illinois, Texas and Cuba.

Mine Superintendents

F. A. OLSON, superintendent of the Greenwood mine of the Inland Steel Co. at Ishpeming, Mich., has been appointed superintendent of lands with headquarters in Ishpeming. W. P. REED has been advanced to assistant superintendent of the Bristol mine at Crystal Falls; and R. O. MARSTEN has been promoted to assistant superintendent of the Sherwood mine at Iron River, Mich.

Heads Stone Company

BRUCE R. FROBENIUS has been elected president of the Kansas Natural Stone Co., Russell, Kan., succeeding the late Chester C. Sellens. Other officers are John G. Deines, vice-president; C. R. Holland, counsel; Kenneth P. Frobenius, secretary; and E. F. Frobenius, treasurer and general manager.

Named Manager

J. J. MCGINLEY, bookkeeper, Garnett Rock Co., Garnett, Kans., has been named manager of the company. He will however continue in his capacity of bookkeeper, a position he has held since the Brosnahan Brothers of Kansas City, Mo., purchased the quarries in 1944.

Superintendent Resigns

F. W. COOPER, superintendent of the Fredonia, Kans., plant of the Consolidated Cement Corp., Chicago, Ill., has resigned to become manager of the rural electrification project at Holyoke, Colo. He will be succeeded by A. E. PILLAR.

Awards Given to 25-Year Employes

RIVERTON LIME AND STONE CO., INC., Riverton, Va., recently awarded service emblems to employes who had been with the company from five to 25 years. Presentation ceremonies took place at the Park Theater in Front Royal, Va., after a special showing of the film "Thunder in the Valley." Employes with 25 years of service who received gold Elgin watches were Irvin Baltimore, G. G. Darr, B. W. Cameron, F. R. Catlett, C. W. St. John, W. H. Wright, E. F. Williams, Lee W. Cook and Omer O. Steed.

M.I.T. Alumni President

C. G. DANDROW, vice-president of Johns-Manville Sales Corp. New York, N. Y., and general sales manager of the industrial products division, has been elected president of the Massachusetts Institute of Technology Alumni Association.

Heads Concrete Sales

ROBERT F. PORTER has been elected vice-president in charge of concrete and building material sales for Harry T. Campbell Sons' Corp., Towson, Md., according to an announcement by Bruce S. Campbell, president of the company.

Elected to Fellowship

DR. PAUL D. V. MANNING, vice-president of the Research Division, International Minerals and Chemical Co., Chicago, Ill., has been elected to fellowship in the New York Academy of Sciences.

Elected a Director

GARFIELD L. MILLER, JR., vice-president of Harold C. Brown & Co., Buffalo, N. Y., investment house, has been elected a director of the Kelley Island Lime and Transport Co., Cleveland, Ohio.

Office Manager

EARL CARSTENSEN, paymaster at the Port Clinton, Ohio, plant of the U. S. Gypsum Co., Chicago, Ill., has been appointed office manager at the plant in Grand Rapids, Mich.

Named Vice-President

MYRON BLACKMAN, formerly vice-president of William R. Whitaker Co., has been appointed vice-president of the Crystal Lime Corp of California.

Appointed Comptroller

FRED KIEWEL, former assistant manager of the General Manufacturing Co., Minneapolis, Minn., has been appointed comptroller of the Carney Company, Inc., Mankato, Minn. Mr. Kiewel was also at one time office manager and chief accountant for the Diamond Iron Works of Minneapolis.

Engineers Appointed

H. B. FOWLER, resident engineer at the Fort Hall mine of the Simplot Fertilizer Co., Pocatello, Idaho, has been appointed chief engineer of the exploration department. C. W. SWEETWOOD, staff engineer, has been named to succeed Mr. Fowler as resident engineer at Fort Hall; and A. I. TAYLOR will assume Mr. Sweetwood's position as staff engineer.

OBITUARIES

CHARLES BOETTCHER, president and founder of the Ideal Cement Co., Denver, Colo., passed away July 2 at the age of 96. Mr. Boettcher, who was born in Germany in 1852, came to America when he was 17, and started his own hardware business in Greeley, Wyo. At the height of the silver mining boom in Leadville, Colo., 1878, he moved his business to that location, and in 1890 settled in Denver. While in Leadville he built the first electric light plant there and later built the first electric light and power plant in Salt Lake City, Utah, as well as completing a contract for the installation of a power plant and distribution lines in St. Louis, Mo.

Charles Boettcher

Mr. Boettcher first became interested in the cement business while building a sugar factory at Loveland, Colo. He noticed that cement used on the job had been shipped in wooden barrels from Germany. Shortly after he acquired the controlling interest in a small plant which had been built but never successfully operated at Portland, Colo. From that time forward he was a dominant figure in the cement industry in this country. The Portland plant was the first of a chain of plants which finally grew to include the Ideal Cement Co. group with plants in Montana, Utah, Colorado, Nebraska, Oklahoma, Texas and Alabama.

In addition to his cement interests, Mr. Boettcher had been active at various times in the meat packing industry, fuse and powder business, cattle ranching, banking, real estate, and railroad and street railway transportation. Although he officially retired in the late 1890's, he became active in business again before the first year of his retirement had elapsed.

EDWIN L. KEATING, who retired four years ago as vice-president of the Colonial Sand and Stone Co., Inc., New York, N. Y., died June 24 at his summer home in Danbury, Conn. He was 63 years of age. Mr. Keating had been in the sand and stone business for 40 years. He had previously worked with his uncle in the John L. Keating Sand and Gravel Co., and had been employed by the Manhattan Sand Co. and the Norton Keating Co.

JAMES LUDWIG JOHNSON, operator of a concrete block plant in Mesa, Ariz., passed away recently. He had been a resident of Mesa for 52 years.

J. E. WILKINSON, formerly superintendent of the Memphis, Tenn., plant of the Missouri Portland Cement Co., St. Louis, Mo., died June 14 after a long illness. He was 63 years old. Mr. Wilkinson had been identified with the cement industry for many years. Until his retirement he was foreman for the J. W. Owen Company.

E. HAROLD BRAYER, president and treasurer of the Rock Asphalt Company and former chief executive officer of the Great Lakes Transit Corp., died June 24 at Buffalo, N. Y. He was 48 years old.

OSCAR KIMMEL, who had been in the building materials business at Marion, Ill., died in that city, June 20, at the age of 72.

ANDREW CRAIG HOUSTON, a member of the firm of Houston Brothers, Pittsburgh, Penn., from 1888 until 1918 when he retired, passed away June 8 at his home in Caledonia, Penn. He was 91 years old and had been associated with his two brothers, Ross P. and Samuel P. Houston, in the building material business.

EDWARD G. BROWN, who had charge of the Milwaukee office of the Janesville Sand and Gravel Co., Janesville, Wis., until his retirement in 1936, passed away June 10 at the age of 88.

CARL A. KRAUSE, secretary-treasurer of Stephens-Adamson Mfg. Co., Aurora, Ill., passed away at his home in Aurora. He was 64 years old.

ALBERT G. BLADHOLM, president of Iron and Steel Products, Inc., Chicago, Ill., died July 6. He was 43 years of age. Mr. Bladholm was one of the cofounders of the company and served as secretary from the time it was incorporated in 1930 until 1942 when he became president at the age of 37.

Construction Starts on P.C.A.'s Research Laboratory

FIRST CONCRETE for the construction of the Portland Cement Association's new two million dollar research and development laboratory was placed on Wednesday, June 30, at a ceremony attended by prominent men identified with the portland cement and concrete industries. The ceremony inaugurating the event took place at the site, on West Harrison St. in the Village of Skokie which is 15 miles northwest of Chicago.

The honor of placing the first concrete fell to CHARLES E. ASPDIN of Hasbrouck Heights, N. J., great great grandson of Joseph Aspdin who, 124 years ago, was granted a British patent for the material which he called portland cement and who is credited with having been the founder of the industry.

Other active participants in the official ceremony were FRANK T. SHEETS, president of the Portland Cement Association; W. C. RUSSELL, president of Peerless Cement Corp., Detroit, Mich.; W. A. WACKER, president of Marquette Cement Manufacturing Co., Chicago, Ill.; and S. W. STOREY, president of the General Portland Cement Co. and Consolidated Cement Corp., Chicago, members of the Board of Directors of the Portland Cement Association.

Mr. Aspdin was officially presented by Mr. Russell who very briefly told of the invention of portland cement and the growth of the industry in the United States from the time portland cement was first imported from England and other European countries.

DR. A. ALLAN BATES, P.C.A.'s vice-president for research and development, in a prepared statement for the conclusion of the ceremony, stressed the value of developments that had resulted from research conducted by the Association and which have benefited the public. Among them are soil-cement and air-entraining portland cement. To emphasize the expanding need for research, Dr. Bates said that when the Association's present laboratory was built in 1926 it was inconceivable that it would become inadequate in the space of two decades. Work to be done in the new laboratory, he explained, will be in the public interest through the solution of technical problems identified with new uses of concrete and in the performance of the product.

The new laboratories will have more than 98,000 sq. ft. of floor space, and are expected to be completed within one year.

Left to right: Chas. E. Aspdin, great, great grandson of the inventor of portland cement; W. A. Wecker, president of Marquette Cement Manufacturing Co.; S. W. Storey, president of General Portland Cement Co., and of Consolidated Cement Corporation; and W. C. Russell, president of Peerless Cement Corporation

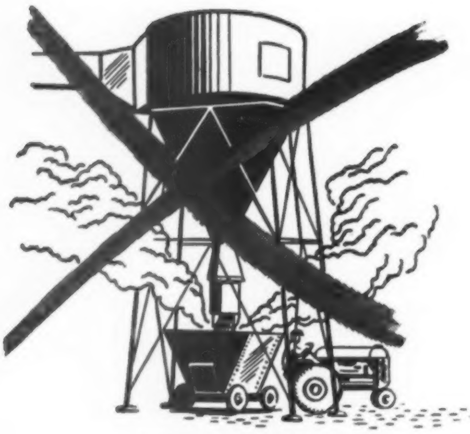
President Frank Sheets, in grey suit, standing on stairway with official personnel standing at ground level, above

Dr. A. Allan Bates and Chas. E. Aspdin, great, great grandson of the inventor of portland cement

Indiana Limestone Centennial

THE INDIANA LIMESTONE INDUSTRY recently celebrated its one hundredth year of commercial sale of the stone by staging a six day ceremony which included tours through mills and quarries in the vicinity of Bedford, Ind., and special parades, dances and other amusements. William G. Riley, president of the Indiana Limestone Co., said representatives from nearly a score of foreign nations participated in the celebration where they were given "cornerstones of freedom," limestone blocks inscribed with a statement from each country participating.

There's no secondary dust problem with a Roto-Clone



NOT THIS

BUT THIS

**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

Wet type collection eliminates rehandling and disposal of dry dust

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AAF Type W and Type N Roto-Clones are both high efficiency wet type collectors. In both units the collected material is discharged as a slurry or sludge. Method of disposal can be varied to meet your requirements.

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LABOR RELATIONS TRENDS

Significance of the E. C. Schroeder Co. Cases

By NATHAN C. ROCKWOOD

IN OUR DISCUSSION of the dire need for revision of the Fair Labor Standards Act as it affects suppliers of material for local construction, on pp. 87 (Notes) and 125 (Labor Relations Trends) in ROCK PRODUCTS, June, 1948, we have discovered two inaccuracies. First, both cases, E. C. Schroeder Co. v. Clifton and E. C. Schroeder Co. v. Clark were decided in the same U. S. Circuit Court of Appeals, 10th circuit, Denver, Colo.; and, second, the two decisions are not in conflict, but on the contrary supplement each other. Nevertheless, the confusion over what the law actually means, or how it is to be interpreted in similar case, has enhanced misunderstandings rather than cleared them. The company has asked the U. S. Supreme Court to pass on this latest case (Schroeder v. Clark), the Court refused to review the previous one; but it is difficult to see how it can pass on one without reference to the other.

Our difficulty arose from a lapse of memory regarding details in the first case, and it is very likely that some of our readers also need to have their memories refreshed. If the Supreme Court does pass on these cases, they will go down in the history of the rock products industries as the first to reach the Supreme Court for an interpretation of the application of the Wage and Hour Law to the kind of business in which many have a vital interest; even if they have been operating under the law, they have an academic interest as citizens. Since there is no chance that the law will be amended before early in 1949, unless Congress is called into special session, the interim might cost some operators thousands of dollars in employe back wage suits, and in any event will cause some uneasiness.

Facts Regarding First Case

The first case, Clifton v. E. C. Schroeder Co., was not a clear-cut victory for the producer or the National Sand and Gravel and National Ready-Mixed Concrete Associations, which had entered the case as friend of the court and to aid the producer. The decision there opened the way for the second case, which was anticipated by the Associations' counsel. The producer and the two Associations tried to prove to the Circuit Court that local material which does not move across state lines is not produced for "interstate commerce" merely because it is used in the construction or maintenance of a highway or railway over which interstate commerce moves. This was (and still is) the ruling of the F.L.S.A. administrator, who encouraged the company's employes to sue for back wages and penalties in the U. S. District Court, Eastern District, Oklahoma, in 1945.

The Schroeder Co., as a subcontractor for crushed stone and gravel, opened a quarry specifically to produce materials for construction of portions of an interstate highway and a railway which had to be relocated because construction of the Denison dam was to flood the old locations. A nearby producing oil field would also have been flooded, and the Federal Government, builder of the dam, agreed to pay for relocation of the highway and railway and for constructing a dike around the oil field. The Schroeder Co. sold its material for construction of the highway and railway to the contractors, f.o.b. plant, but in the case of the dike had some of its own trucks and employes make deliveries. The truck loads were dumped on the dike, and often the material needed no rehandling. It is necessary to keep this distinction between the different jobs in mind in order to understand what follows.

The District Court found that the quarry employes, while not engaged in interstate commerce, were producing goods for interstate commerce by virtue of furnishing rock "for the continued movement of interstate commerce," so far as the highway and railway construction was concerned. On the other hand the workmen producing rock for the oil field dike were held not to come under the F.L.S.A., but the truck drivers serving the job (that is, dumping on the dike) were held to be engaged in construction of the dike, and hence did come under the law.

Appeals Court Decision

The District Court decision was appealed by both sides, and at this point the U. S. Department of Labor attorneys (for the F.L.S.A. administrator) and attorneys for the National Sand and Gravel and National Ready-Mixed Concrete Associations entered the case as friends of the court. Here the District Court's decision was reversed both ways. By two to one decisions the Circuit Court judges decided that the quarry employes producing material for the *highway and railway relocation jobs did not* come under the Act, but that the employes *producing rock for and servicing* the dike construction job *did* come under the Act, since they were producing goods which "constituted part of an integrated effort having for its purpose the protection of the oil field from being flooded in order that production of oil and its movement in interstate commerce might continue."

That this fine distinction was difficult even for the judges themselves is evidenced by the dissenting opinions of two of them, one of whom while favoring reversal of the lower court's decision on the employes engaged in producing highway and railway material, would also have affirmed instead of reversing the lower court's decision that the production of material for the dike was actually still farther removed from production of goods for interstate commerce. The third judge concurred in reversal of the case of the oil field dike material, but dissented in the case of the highway and railway material. This confusion in the minds of the circuit court judges themselves is the best possible argument for revision of the F.L.S.A., as suggested in our June issue, already referred to.

Latest Circuit Court Case

It will be noted from the foregoing that the Circuit Court of Appeals, while settling the case of material produced for highway and railway relocation, also opened the way for those Schroeder Co. employes, who had produced and delivered stone for the oil field dike, to bring a new suit, with apparently the assurance that this Circuit Court would rule in their favor. They accordingly did so in the case of the E. C. Schroeder Co. v. Clark, which was decided in their favor on April 24, 1948, as noted in the June issue of ROCK PRODUCTS. This decision, like the preceding one in January, 1946, is a reversal of the original District Court decision, but actually an affirmation of the Circuit Court's own 1946 decision. The dissenting judge was the same one who held against reversing the lower court on the same issue in the first case.

While this latest case is now on the docket of the U. S. Supreme Court, it will not come up before next fall, and may not receive any more consideration than was given the first Schroeder case, which the Supreme Court refused to review. Now, however, that all the facts are before us, there should be no question in the minds of our readers of the seriousness of these two decisions. The producer has now been held to have two groups of employes working together in the same operation—those under the F.L.S.A. and those not. Since probably these two groups are actually one and the same, having made crushed stone for both jobs simultaneously or alternately, some idea of the complications involved can be guessed. Moreover, the decision was not clean-cut as regards those producing rock for the highway and railway jobs, since the 1946 Circuit Court decision made a point of the fact that these were new locations over which there was no interstate traffic until the crushed stone supplier had fulfilled his contract. There is the implied suggestion that the decision might have been different if the material were supplied to an interstate

(Continued on page 177)

INDUSTRY News

Conservation Program Gets Big Appropriation

RECENT Congressional action with respect to conservation has extended the Agricultural Conservation Program for two years, 1949 and 1950. An amount of $150,000,000 has been appropriated for the calendar year 1948, and $262,500,000 has been authorized for the 1949 program.

The new bill is reported to be a last-minute compromise and deals primarily with price supports which would have expired on December 31, 1948, unless some action was taken. Briefly, the bill as passed provides for a continuation of present price supports, with minor changes, during 1949 under the provisions of the House bill, and starting in 1950 the long-range support feature, including the new parity formula of the Senate, will become effective.

Plant Expansion

MINNESOTA MINING AND MANUFACTURING CO., St. Paul, Minn., recently awarded a contract to Turner Construction Co. for additions and alterations to a plant at Bristol, Penn., acquired from the War Assets Administration. The project will cost about $800,000, and is part of a $20,000,000 expansion program. The company makes pressure-sensitive tapes, coated abrasives and roofing granules.

FHA Bill Approved

CONGRESS has approved a Federal-aid Highway Act which will make available to the States $450,000,000 for each of the fiscal years 1950 and 1951. Provision is also made for an increase from 2½ percent to 3¾ percent in the amount to be allowed from authorized Federal-aid funds for administering provisions of the Act and for highway research and investigational studies.

Reopens Rock Cut Plant

GENERAL CRUSHED STONE CO. has reopened its plant at Rock Cut, near Syracuse, N. Y., after 15 years of inactivity. The company also operates a screening and washing plant at Fayetteville, N. Y.

The operation in Rock Cut, along the Lackawanna Railroad, is reclaiming approximately 1,000,000 tons of limestone left there in surplus piles over 30 years ago, and for which there was no profitable market at the time. Some 800 to 1000 tons of stone dust and sizes 1-A and No. 1 are being reclaimed.

Diesel power pumps the water, generates the electricity, and runs the Rock Cut plant. The water is taken from a swamp pond in the cut, fed by springs from the drumlins. This water is not returned directly after use, but is passed through two, 40 x 100-ft. sludge ponds, walled with stone, and operated as settlement beds.

Maurice Alderman is superintendent of both the Rock Cut and Fayetteville operations.

Colorado Freight Rate Increase

THE COLORADO PUBLIC UTILITIES COMMISSION has granted a permanent 20 percent freight rate increase to Colorado railroads, following the same pattern set by the interstate commerce commission. Some exemptions were given. Cement, limestone and certain related products were allowed only a 10 percent increase.

Produce Agstone

GORDON BROTHERS QUARRIES, INC., Oregon, Mo., has started operations turning out from 80 to 100 tons of processed rock per hour in 1 and 1¼-in. sizes. The product tests 95.8 percent lime by the Department of Agriculture, owners, Russell and Connie Gordon and Cecil Richardson, report.

Fluorspar Mill To Fight River Pollution

THE GENERAL CHEMICAL DIVISION of Allied Chemical Corp., new owners of the Salida fluorspar mill, have pledged cooperation with a statewide move to halt illegal pollution of Colorado waterways. The company will provide facilities for complete settling of solids from tailings, so that nothing but clear water will be overflowed into the Arkansas River.

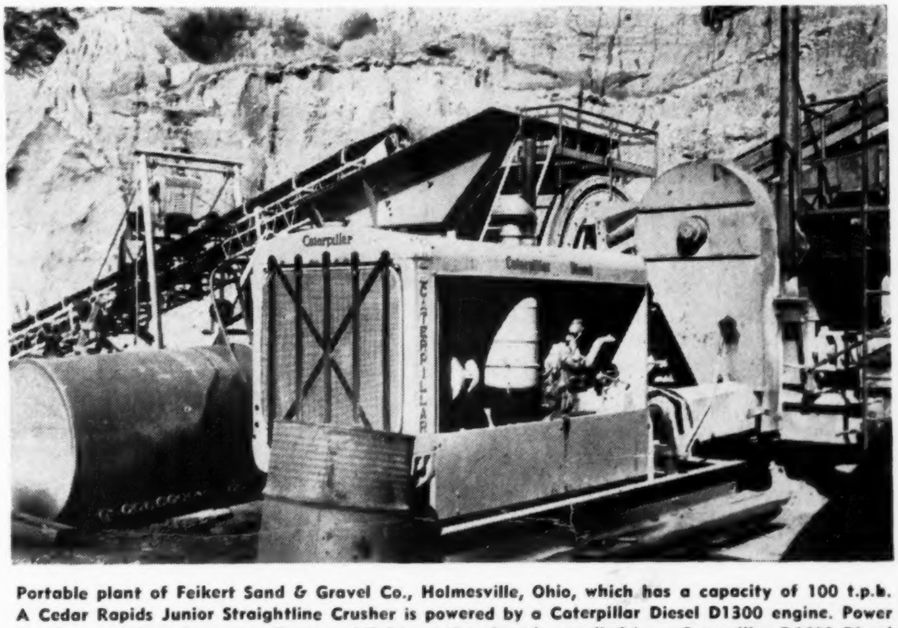
Allied Chemical Corp. purchased the Salida mill from Colorado Fluorspar Co. at a reputed $250,000,000. Allied also owns the Bellmonte mill at Boulder, a fluorspar mine at Jamestown, and an acid plant at Denver.

Agstone Made Duty-Free

A BILL providing for the free entry of limestone into this country for use in the manufacture of fertilizer has been signed by President Truman. The measure is designed to help ease a shortage of fertilizer here?

Cement Contract

UNIVERSAL ATLAS CEMENT CO., Chicago, Ill., will provide 270,000 bbls. of cement to be used for Bull Shoals Dam on the White River near Little Rock, Ark. Expected to cost $58,000,000, the project will provide power, flood control and irrigation facilities.



Portable plant of Feikert Sand & Gravel Co., Holmesville, Ohio, which has a capacity of 100 t.p.h. A Cedar Rapids Junior Straightline Crusher is powered by a Caterpillar Diesel D1300 engine. Power for the screening plant as well as yard lights at the plant is supplied by a Caterpillar D4600 Diesel electric set

Cement Plant Construction In Africa

CEMENT FACTORIES working at full capacity still are unable to meet domestic demand in the Union of South Africa, an article in *Mineral Trade Notes* states. However, new factories currently under construction, are expected to double the present 1,300,000 ton per year capacity by the end of 1949.

New construction includes a $6,000,000 factory at Lichtenburg which will have a capacity of some 7,000,000 bags per year. Anglo-Alpha Cement Co. is building a new plant at Ulco, Orange Free State, which will have an annual output of 200,000 tons. A new $3,750,000 factory, which will produce 100,000 tons annually, is being planned at Durban by the Natal Portland Cement Co. Still another plant is being built at Port Shepstone, Natal, by Consolidated Portland Cement Co., Ltd., which will produce approximately 200,000 tons per year.

Establish Research Department

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA have established a Department of Research with Harry J. Kirk as manager. Purposes of the new department will be to study and correlate information on contract documents and specifications, uses and cost of owning construction equipment; and construction statistics.

Sells Interest In Stone Company

HARRY W. LANWEHR, affiliated with the Lanwehr Stone Co., Ottawa, Ohio, for the past 26 years, has sold his half interest in the business to Albert Schumacher. Alva Lanwehr will retain his interest and has entered a partnership with Mr. Schumacher. The firm will continue operations under its same name.

Cement Shortage in Canada

DESPITE DOUBLING of Canada Cement Co.'s Exshaw, Alberta, plant capacity, a cement shortage still is hampering a $533,000 paving program in Edmonton City, company officials claim, due to a spring rush from dealers for cement for general distribution. The Exshaw plant is producing 20,000 bags of cement per day at present.

Installs Hot-mix Plant

CENTRAL SAND AND GRAVEL CO., Pasco, Wash., has installed a hot-mix asphalt plant, capable of producing asphaltic concrete for high-grade paving jobs, and is already turning out materials for three installations, according to Jack Jackson, manager. New equipment cost approximately $20,000.

Sand Dredgers Reach 1948 Quota

SAND DREDGING OPERATIONS in Lake Erie, ordered cut 50 per cent this year to help fight against beach erosion, already have taken the full quota of sand from the lake this season, State Public Works Director George B. Sowers has disclosed.

Commercial dredging companies had been taking about 350,000 cu. yds. of sand from the lake annually, and with the 50 per cent cut, have already reached their quota even though the season is only a third gone. "The sand dredgers apparently didn't warn concrete interests and builders," Sowers said, "and now they are all screaming for more sand."

A permit to dredge in the West Sister Island sand shoals about halfway between Put-in-Bay and Toledo is being sought to relieve the shortage. "In fact special permits may have to be issued to obtain sand for highway construction work," Mr. Sowers concluded.

Disposes of Gypsum Properties

PACIFIC PORTLAND CEMENT CO., San Francisco, Calif., has reported disposal of its plaster mill and gypsum properties at Empire, Nev. The company has reserved all its brands and trade marks used in the gypsum and plaster business, together with other gypsum properties and gypsum reserves and resources located in California, Nevada and elsewhere, according to J. A. McCarthy, president. Manufacture of gypsum wall board and gypsum products will be continued at the company's Redwood City mill.

Purchase Quarry Equipment

N. J. COOKSEY has purchased quarry equipment from the Moberly, Mo., Eight Mile Road District at a cost of $51,440 and will provide the District with 30,000 tons of crushed rock in the next two years, it has been announced.

Along with the acquisition of the quarry equipment, Mr. Cooksey said he had obtained a 3-year lease on the quarry site. Daily capacity will be 800 tons of crushed rock. Additional equipment will be installed to produce agricultural limestone.

Associations Move

THE SOUTHERAN CALIFORNIA Rock Products Association and the Southern California Ready Mixed Concrete Association have announced a change of address from 835 H. W. Hellman Building, Los Angeles 13, to 1722 North Eastern Avenue, Los Angeles 32.

WAA to Sell Explosives

MORE than three and a half million lbs. of war-surplus, high-explosive M-1 and M-3 demolition blocks and MK-8 demolition charges are being offered for sale at fixed prices by War Assets Administration, an announcement states.

The demolition blocks may be used in place of TNT or 40 to 60 percent dynamite, except in underground operations, it is claimed. In addition M-3 blocks will give closer contact between the explosive and the object to be blasted, and are said to be ideal for excavating, quarrying and many other industrial uses.

Spanish Cement Plant Approved

THE MINISTER OF PUBLIC WORKS, Spain, has approved plans for a cement plant to be built at Villaneuva del Rio, Seville Province, by the Guadalquivir Hydrographic Commission, according to *Mineral Trade Notes*. The plant, which will manufacture portland cement with an annual capacity of 50,000 tons, is to be the property of the Spanish Government and will be under the supervision of the Office of the Ministry of Public Works.

Opens Limestone Plant

ABRAHAMSON-NERHEIM CO. has opened a limestone crushing plant at Muskegon, Mich., to serve farmers in the area. Limestone rock to be crushed comes from the Inland Lime and Stone Co. quarries at Manistique, Mich., and is brought in by lake freighters.

Grinds Talc For Competitor

W. H. LOOMIS TALC CO., New York, has been grinding talc ore for a competitor, the International Talc Co., since curtailment of International's facilities by a serious fire which destroyed one of the major mills at Hailesboro. The Loomis corporation will continue to assist until enlargement of International's No. 6 mill at Hailesboro is completed, a report states.

Aggregate Plant Sold

SHELBY ALLRED has sold his interest in a $60,000 rock crushing company at Kirsville, Mo., to Fred Luman and Ruby Green, who have installed new equipment and will furnish aggregate for ready mixed concrete.

Reopen Gravel Pit

HAROLD AND ROALD DOLVA have reopened the Dolva gravel pit near Hawley, Minn., to furnish gravel and sand for construction and road work.

A.S.T.M. Supplements To 1946 Standards

THE AMERICAN SOCIETY FOR TESTING MATERIALS has announced 1947 Supplements to the 1946 Book of A.S.T.M. Standards, a publication issued triennially. The Supplements, in five parts, give in latest approved form some 330 specifications, tests, and definitions, part of which cover cement and lime, refractories, brick, concrete and concrete aggregates, and road and paving materials. Copies may be obtained from A.S.T.M. Headquarters, 1916 Race Street, Philadelphia 3, Penn.

Establish Rock Quarry

LIVINGSTON TRUCK & MATERIALS Co. plans to establish a rock quarry on a 40-acre site near Richmond, Mo.

Coming Conventions

August 26, 1948—
Pennsylvania Stone Producers Association and the Agricultural Limestone Division, Annual Outing, Carlisle Country Club, Harrisburg, Penn.

September 20, 1948—
National Sand and Gravel Association, Directors' Meeting, The Broadmoor, Colorado Springs, Colo.

September 22, 1948—
National Ready Mixed Concrete Association, Directors' Meeting, The Broadmoor, Colorado Springs, Colo.

September 28-29, 1948—
National Lime Association, Meeting of Board of Directors and Executive Committee, The Cloister, Sea Island, Ga.

October 14-16, 1948—
American Institute of Mining & Metallurgical Engineers, Industrial Minerals Division, Regional Meeting, Sheraton-Coronado Hotel, St. Louis, Mo.

October 18-22, 1948—
National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill.

October 20, 1948—
American Institute of Mining and Metallurgical Engineers, Industrial Minerals Conference.

October 20-22, 1948—
National Industrial Sand Association, Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

November 4-6, 1948
Operating Division, National Lime Association, Meeting, Palmer House, Chicago, Ill.

February 7-9, 1949—
National Crushed Stone Association, 32nd Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

February 13-17, 1949—
American Institute of Mining and Metallurgical Engineers, Annual Meeting, San Francisco, Calif.

February 14-18, 1949—
National Ready Mixed Concrete Association, 19th Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

February 14-18, 1949—
National Sand and Gravel Association, 33rd Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

January 22, 1950—
National Sand and Gravel Association, 34th Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

Week of January 22, 1950—
National Ready Mixed Concrete Association, 20th Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

Week of January 29, 1950—
National Crushed Stone Association, 33rd Annual Convention and Exhibit, Stevens Hotel, Chicago, Ill.

Send Sand to Tel Aviv

BERKSHIRE GLASS SAND CO., Cheshire, Mass., each spring is mystified by an order for twenty tons of sand to be sent to Tel Aviv, Palestine, which is located on the edge of the Syrian Desert and built on a sand bar. The trip is a costly one for the sand, which is sacked in triple burlap bags to make the journey intact.

Purchaser of the sand is the American Porcelain Tooth Co. of Tel Aviv, and Berkshire company officials, believe that their product might be processed into artificial teeth and porcelain fillings, or to sandblast rough surfaces of dental castings fresh from the furnace.

Complete Action On ACP Appropriations

ACTION has been completed by Congress on the appropriation for the 1948 Agricultural Conservation Program and the authorization for 1949 providing $150,000,000 for the calendar year 1948, and $262,500,000 for the calendar year 1949.

Establishes Sand and Gravel Plant

ED BESKE, Bird Island, Minn., is establishing a sand and gravel plant near Atwater, to be known as the Atwater Sand and Gravel Co. Over $30,000 is being invested in equipment for the plant which will have a capacity of 50 yds. of washed gravel per hr.

Construct Agstone Plant

WHITE RIVER LIMESTONE PRODUCTS crushing plant, Batesville, Ark., is under construction, according to V. C. Johnson and Howard C. Miller, owners.

Granted Permit To Open Quarry

BLUE DIAMOND ROCK CO., Monrovia, Calif., has been granted permission to operate a rock quarry in the Duarte district, near the Santa Fe Dam.

Complete Warehouse Line

A. JAY HOFMANN CO., Narberth, Penn., announces that they are now in production on a complete line of prefabricated warehouses of both steel and wood design. These warehouses come in three single span widths of 24-, 30-, or 40-ft., and any length desired.

New Address

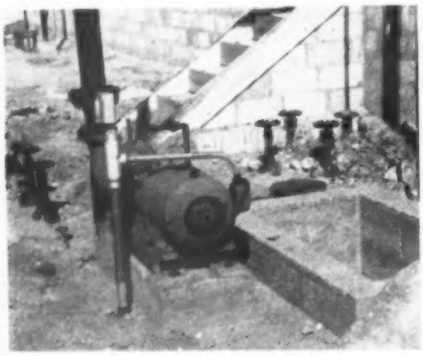
SUPERIOR INSULATION MANUFACTURING CO. has announced its new address as Post Office Drawer E, West Duluth 7, Minn.

HINTS *and* HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Reagents Handling

PLANTS treating up to 5000 tons of material per day, using several types of liquid reagents in amounts that range from a fraction of a pound per



Pumps for handling car-lot amounts of reagents reagents

ton to 4 lbs. per ton, find gallonage consumed per month running into car-lot figures. In order to handle this amount of reagents efficiently and economically, and to do away with endless numbers of barrels, suitable equipment must be provided. At one flotation plant in the industry, the materials are delivered in car lots, the tank cars emptying to a concrete sump alongside the track, from which a small centrifugal pump picks up the liquid reagent and pumps it to storage.

Holding Motors Secure

WHERE a Diesel or gasoline motor is mounted for temporary work, there are three standard methods for making sure the unit does not pull ahead due to stresses on the belt, it has been observed. The simplest is illustrated in Fig. 1 where the Caterpillar engine is mounted on skids buried partially in the ground. A cross piece of planking is nailed in front of the base as shown.

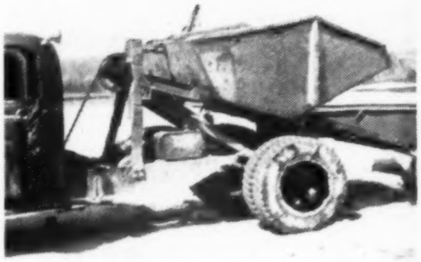
In Fig. 2, the pulley end of a similar Diesel was held securely by means of a "Come-Along" with the dead end of the chain hoist fastened to a suitable dead-man—in this case a piece of heavy drill steel driven angling into the ground.

Fig. 3 shows how a Murphy Diesel can be held by means of a heavy railroad jack with its base angling against the side of a shallow pit dug in the dirt. The disadvantage of the last two methods, however, is that someone usually borrows the jack, and in a short time the engine belt is off the pulley.

Removable Body for Dump Truck

THE NORTH CAROLINA GRANITE CORPORATION, Mt. Airy, N. C., produces some of the finest dimension stone in the world. All rejected stone is processed for chicken grits and commercial aggregates. As the quarry covers an area of about 80 acres, and all work is from the top down, dimension stone and rejects are scattered over a wide area.

To gather up the rejects, the company has devised a truck body that uses a special detachable body, shown in the illustration. The chassis of the truck is inclined, and is provided with rollers mounted on the two parallel structural steel inclined sections making up the chassis. A steel cable connected to a power take-off raises and lowers the steel body. The truck



Special dump body for reject stone is mounted on inclined chassis rails for ease in unloading and loading

takes an empty body to a desired point where it is dropped off and loaded either by hand or by power shovel. The driver then picks up the load, pulls it up the truck incline and is off to the primary crusher where the inclined chassis rails permit the body to roll down and unload itself.

New Welding Technique Speeds Construction

VIRGINIA-CAROLINA PHOSPHATE CO. speeded construction at its new Florida plant through the use of a new welding technique. At the time of inspection, cement-asbestos siding was being placed on the buildings, although the plant already was in operation. The corrugated sheathing was fastened to the steel framework, with the use of a special, small diameter bolt and nut and an electric welding circuit. The steel framework of the building was one leg of the circuit and the holding tool for the special bolt was the other leg. The operator inserted the bolt in the hole, and with a

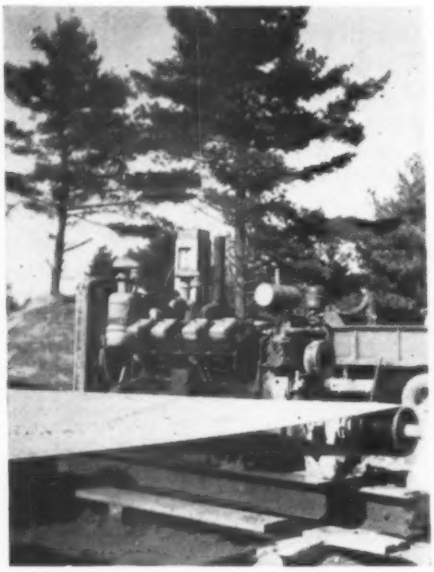


Fig. 1. Engine held secure by heavy plank

Fig. 2. Diesel held by "Come-Along"

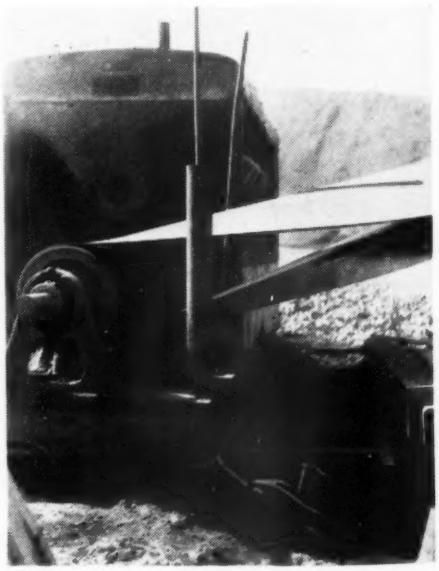
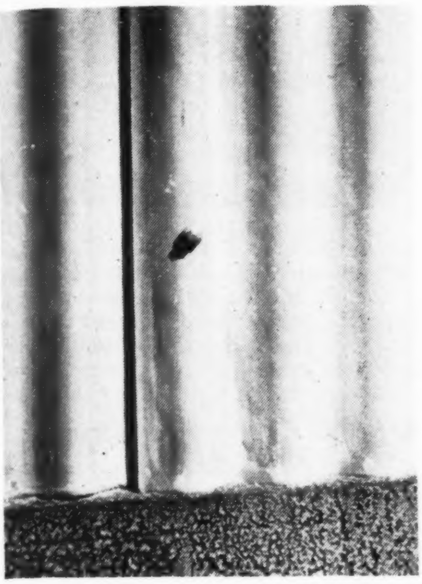


Fig. 3. Diesel held by railroad jack



Bolt spot welded to steel frame of building in placing cement-asbestos siding

quick flash the opposite end was welded to the steel framework after which the lead washer and nut were put on the bolt and the job was done.

Power Unit for Wagner Turbidimeter

By D. M. BROAD*

IN USING the Wagner Turbidimeter for determining the surface area of Portland cement, considerable inconvenience was experienced in keeping the six-volt storage battery sufficiently charged for satisfactory operation of the turbidimeter.

Before this compact and self-contained power unit was constructed, it was necessary to have two six-volt storage batteries, one to be used as a stand-by, the other to be connected to the turbidimeter. Many times both batteries were found with insufficient power, due to neglect or oversight.

By using this power unit, the operator simply manipulates two toggle switches, in the charge position, or in the service position, and a fully-charged battery is available. This operation is acquired by placing switch *D* in the ON position, with switch *C* in the OFF position, *C* disconnecting the battery or six-volt d.c. supply to the turbidimeter, while *D* in the ON position supplies the battery charger with 110 volt a.c. to the charger and also connects d.c. voltage from charger to the battery.

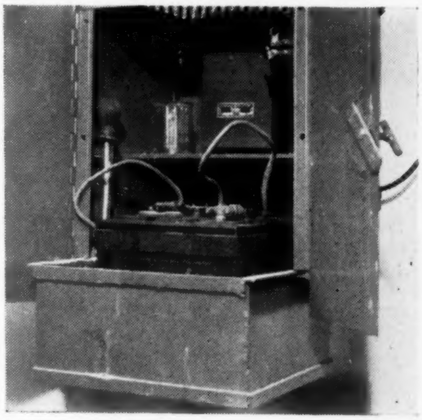
This operation is made when the turbidimeter is not in use. When the turbidimeter is to be placed in service, the operation is reversed, placing switch *D* in the OFF position and switch *C* in the ON position. The battery charger is a five-ampere charger. A five-ampere charge is normally a fair charging rate, but I found it to be rather high, in this particular application. By inserting a variable resistance of 25 ohms in the circuit, the charging rate can be changed in accordance with the use of the turbidimeter.

By having the charging rate of 0.7 amps., the battery can be kept at a full charge without getting an unstable or irratic voltage change in the battery, which may be caused by too fast a charge, thus avoiding lost time, by the operator, while waiting for the battery to steady itself. A slower charge will also increase the life of the battery.

If it is found that the charging rate is either too low or too high, the charging rate can be varied by changing the setting on the variable resistance *G* either one way or the other as desired, which can be noted on ammeter *E*. This ammeter is a flush mounted meter, supported on the outside of the cabinet, between toggle switch *C* and *D*. Placed in convenient position, it will inform the operator if the battery is on charge and at what rate of charge.

The cabinet of the power unit is 18¼ in. high, 12½ in. deep, and 15¼ in. wide, with a double hinged door in the front. The top of the cabinet is made of perforated sheet metal to ventilate the power unit. On the inside of the cabinet, the battery charger *F* is mounted in the rear center. At the extreme top of the cabinet, below the battery charger, is a barrier of ¼-in. sheet rock or sheet asbestos, extending 2 in. to the front of the battery the entire width of the cabinet. This barrier forms a shield against battery acid fumes rising directly into the charger.

The lower part of the cabinet or battery container is 12¾ in. wide, 11¼ in. deep, and 6½ in. high. It is made to use as a pull or sliding drawer, sliding between two pieces of 1- x 1- x 8-in. angle iron. The battery may therefore be replaced or examined



Compact and self-contained power unit for Wagner turbidimeter

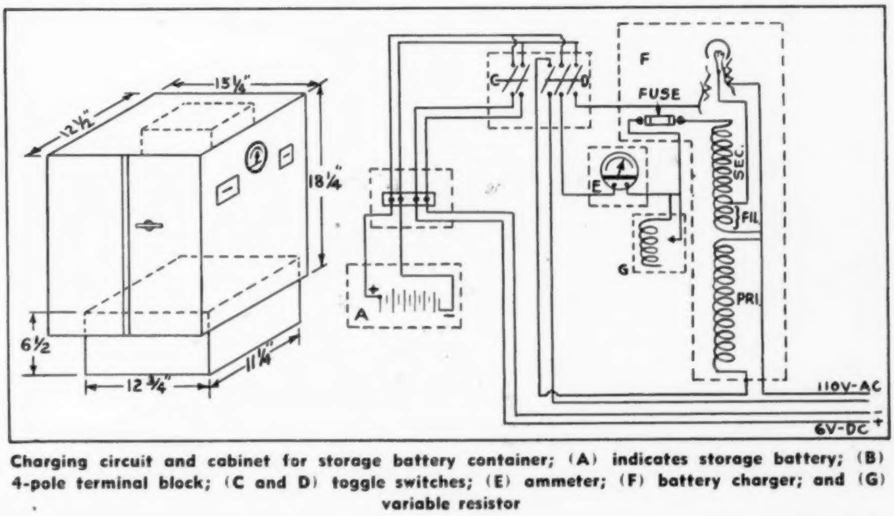
conveniently, by sliding the drawer towards the front of the cabinet, thus making the battery easily accessible. The inside of the drawer is painted with acid-resistant paint, with approximately 2-in. of sand in the bottom of the drawer.

Ammeter *E* and toggle switches *C* and *D* are all flush-mounted, and can be placed on either the left or right side of the cabinet of the power unit for the convenience of the operator.

The power unit cabinet is wall-mounted as close as possible to the turbidimeter. The a.c. voltage can be obtained from any convenient two-wire, rubber-covered appliance cord of No. 16 or No. 18 awg. stranded end, having an attachment plug for the outlet.

A terminal block is used in the attachment of the turbidimeter leads, the size of the turbidimeter leads being governed by the distance the turbidimeter is located from the power unit. It is also used to attach the battery leads to the unit.

The purchase price of the materials, less the labor of constructing the power unit should not exceed fifty dollars. All materials such as the battery charger, ammeter, switches, etc., are ordinary catalog material which can be procured very readily.



Charging circuit and cabinet for storage battery container; (A) indicates storage battery; (B) 4-pole terminal block; (C and D) toggle switches; (E) ammeter; (F) battery charger; and (G) variable resistor

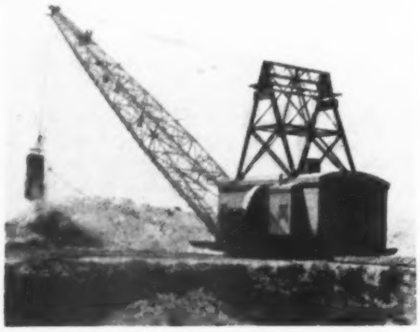
*Chief Electrician, National Portland Cement Co.
The author reserves all rights of manufacture for sale of the power unit and circuit described.

new machinery

ROCK PRODUCTS

Walking Dragline

BUCYRUS-ERIE Co., South Milwaukee, Wis., recently announced a new model in its line of walking draglines, designated the 450-W and incorporat-

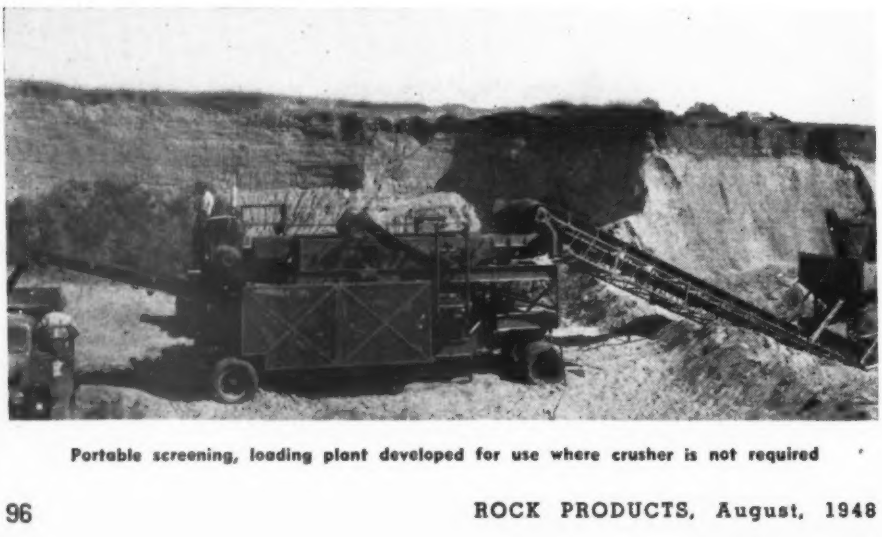


Walking dragline capable of moving material 407-ft. without throwing bucket

ing many post-war design features. The machine swings 8- to 10-cu. yd. buckets from 165- to 200-ft. booms. With an 8-cu. yd. bucket and a 200-ft. boom, material can be moved 407-ft. without throwing bucket. Weights and loads are balanced so that the center of gravity shifts through a limited range, keeping base rim pressures low. The machine can walk in any direction on soft ground due to large area base and shoes. Powered by a Diesel engine, hoisting and lowering are controlled through air-operated clutches and brakes. Swing machinery is controlled by Ward-Leonard variable-voltage equipment.

Screening, Loading Plant

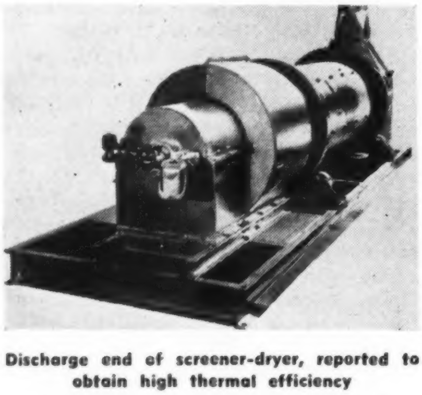
IOWA MANUFACTURING Co., Cedar Rapids, Iowa, has started production of a portable screening and loading plant for use in aggregate production in which a crusher is not needed. The new unit consists of a Cedarapids heavy-duty double-deck vibrating screen, three folding type channel frame conveyors and an apron feeder with charging hopper and grizzly, all mounted on a pneumatic tired trailer. Power required is 40 to 50 hp., with clutch and power take-off shaft and a governor set at 1200 r.p.m. full load. It is stated that this new unit will handle either gravel or rock from pit, stockpile or quarry, size it to specification and load it to truck, bin, or stockpile.



Portable screening, loading plant developed for use where crusher is not required

Screen-Dryer Combination

MINES EQUIPMENT Co., St. Louis, Mo., announces availability of a new rotary dryer-screener, that handles limestone, sand, or other similar inorganic free-flowing materials. The manufacturer states that the new model will dry and screen 2 to 3 tons of sand per hr. having an initial moisture content of 6 percent. De-



Discharge end of screener-dryer, reported to obtain high thermal efficiency

signed to operate on the direct heat principle, greater thermal efficiency is obtained by pre-heating incoming sand with exhaust gases. Located at the discharge end, the screen separates fines from the balance of material. The unit is built with three different types of burner available: low pressure oil; high pressure oil; natural or artificial gas.

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Filter Cloth

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cup has an "Ejector Plate," that serves as the back of the bucket but which is attached to the elevator belt by an entirely separate mounting than for the bucket itself. Passage of this mounting over the radius of the head pulley moves the plate in a strong sweeping action, dislodging bucket contents. These buckets, can be easily substituted for buckets now in use on any elevator without major change in the elevator itself, utilizing standard hole punchings.

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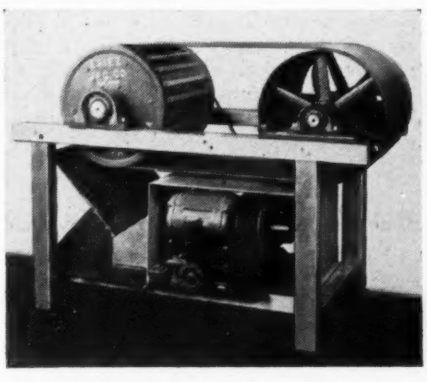

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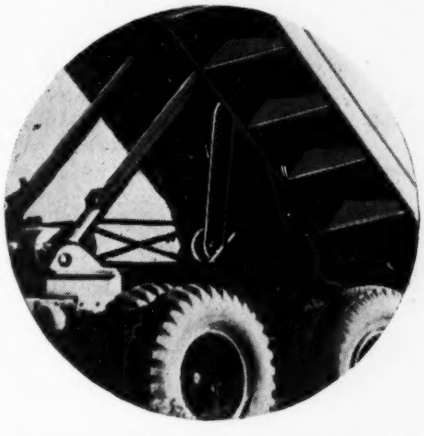

Close-up of winch-powered block and tackle dump mechanism

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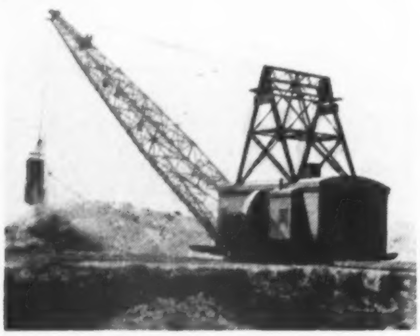

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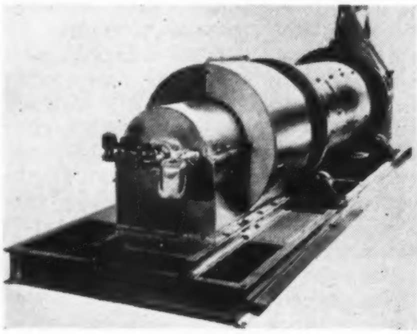

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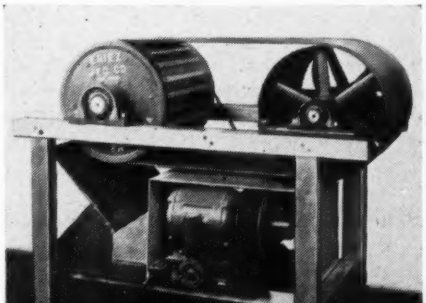

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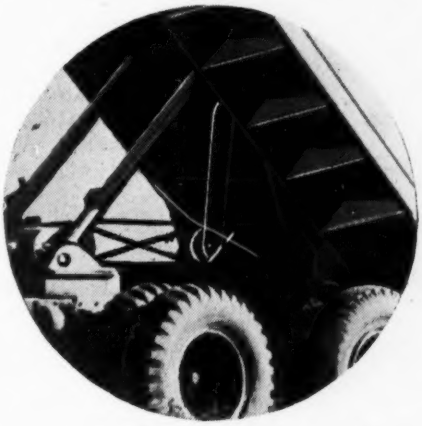

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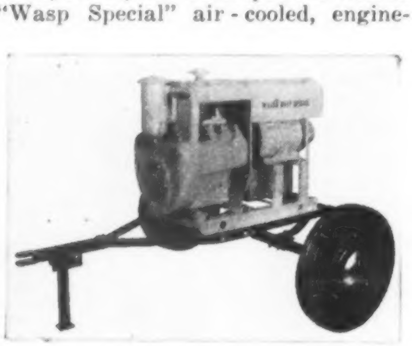
Arc Welder

AIR REDUCTION SALES CO., New York, N. Y., has developed its Wilson "Wasp Special" air-cooled, engine-



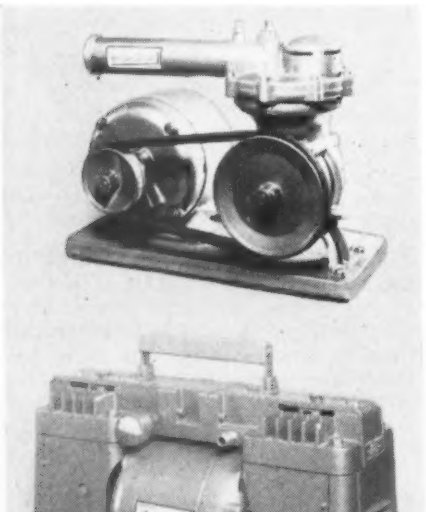
Arc welding machine

driven arc welding machine. This 200-amp. arc welder has a welding range of 25 to 250 amperes at 30 volts, 50 per cent duty cycle.

Portable Air Compressors

AMERICAN BRAKE SHOE CO., Kellogg Division, has announced two portable fractional-horsepower air compressors which are said to produce 100 per cent oil-free air.

Model 17-C delivers 4.4 c.f.m. free air at 40 lbs. pressure. Driven by a ½-hp. electric motor, the compressor is equipped with sealed ball bearings which, it is claimed, eliminate the necessity of oiling and the danger of burned-out bearings. The entire mechanism is encased in welded steel frames for greater stability. This model has two air cleaners which are



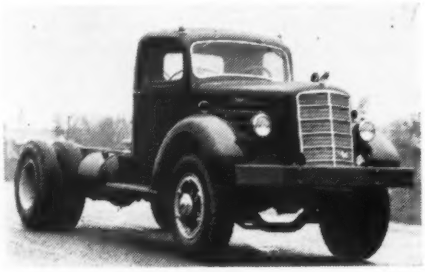
Two portable compressor models. Above, Model 8-C delivers 2.2 c.f.m. at 25 lbs. pressure; below, Model 17-C delivers 4.4 c.f.m. at 40 lbs. pressure

quickly accessible by loosening only two cover screws.

Powered with a ¼-hp. electric motor, the Model 8-C delivers 2.2 c.f.m. at 25 lbs. pressure. It is equipped with a single air cleaner, and has no cylinders, pistons or rings. A force feed oil system assures positive lubrication. Both compressors are adaptable for low pressure, high volume work.

Thermodyne-Powered Tractor

MACK MANUFACTURING CO., Long Island City, N. Y., has brought out a 45,000-lb. basic gross-combination-weight tractor powered by the well-known Thermodyne engine and offering the Mono-Shift transmission. Designated Model EQT, this large tractor has the new 431-cu. in. Thermodyne engine. At its governed r.p.m. of 2500, the engine develops 139 hp. Linking the engine to the transmission is a 13⅞-in. diameter single-plate



Heavy duty truck with chassis having side-members of pressed carbon-steel joined by cross-members of box-girder design

dry clutch with an engagement of 202 sq. in.

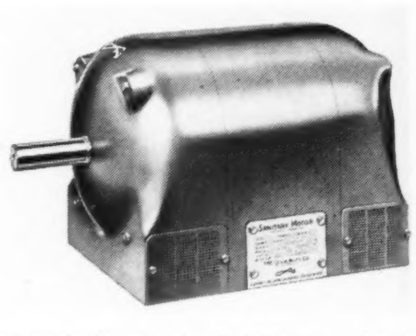
Two types of transmission are offered; the standard TR-311 five-speed, direct-in-fifth transmission, or the Mono-Shift TRD-313 duplex transmission offering ten speeds, and controlled by a single gear-shift lever. With the Mono-Shift, compound shifts in either direction may be made simultaneously with main-box shifts.

Increased Ratings For Tractor

INTERNATIONAL HARVESTER CO., Chicago, Ill., has announced increased horsepower ratings for its TD-14 Diesel crawler tractor. The TD-14 now develops 72 hp. at the flywheel, 68 belt horsepower, and 57 drawbar horsepower at 1400 r.p.m. Compression ratio of the engine has been increased to 15½ to 1.

Develop Splash-Proof Motor

LOUIS ALLIS CO., Milwaukee, Wis., has developed a splash-proof motor particularly developed for operation in wet, humid locations. This motor may be washed with pressure hose without injury to windings. All frame sizes are in accordance with NEMA standardized frame dimensions. Mod-



Streamlined motor developed for operation in wet, humid locations

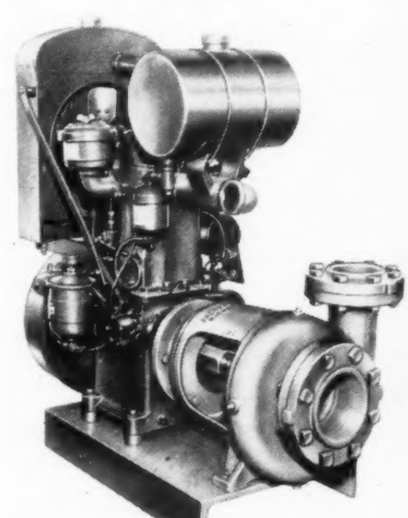
els are in production in all standard and special voltages, frequencies and electrical modifications; and can be supplied with the Type C flange for pump applications.

Mild Steel Electrode

THE WILSON WELDER AND METALS CO., INC., New York, N. Y., has announced the Wilson No. 109 all-position arc welding electrode for welding of mild steel. This electrode is available in ⅛-in., 5/32-in., 3/16-in., 7/32-in., ¼-in., and 5/16-in. diameters, and was developed to fill a demand for an electrode of the E6012 class. It is said that this electrode has excellent operating characteristics with a minimum of spatter with either a.c. or d.c., and a high degree of welding performance is obtained throughout the entire length of the electrode.

Diesel-Driven Pump

JACUZZI BROS., INC., Richmond, Calif., and St. Louis, Mo., has developed several 6- and 8-hp. pumps driven by single-cylinder Diesel engines equipped with electric starters. The Diesel engine can be connected to the pump either directly or by a belt, depending upon the depth of water or pressure required.

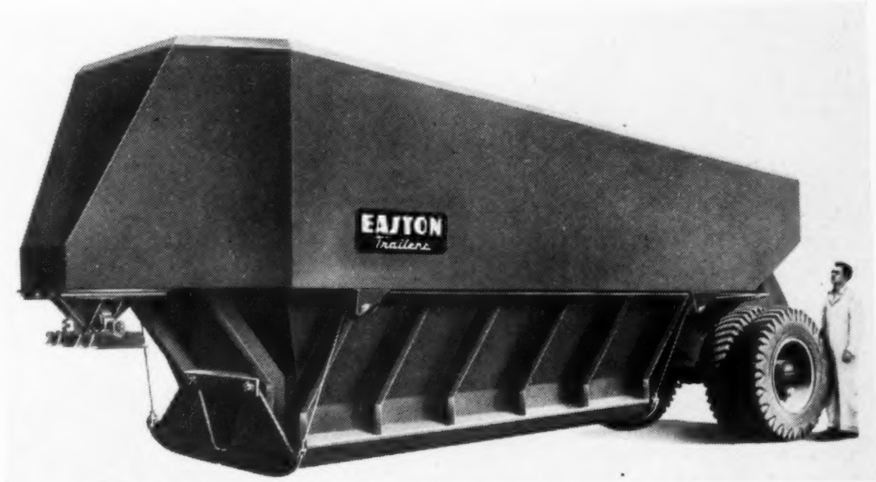


Pump driven by Diesel power

Dump Trailer For Sand and Gravel

EASTON CAR & CONSTRUCTION CO., Easton, Penn., has designed a bottom-dump trailer, Model TB-4030, which is said to be particularly adaptable for the haulage of sand and gravel. It was originally designed to haul 32-ton loads of bituminous coal in strip mining operations.

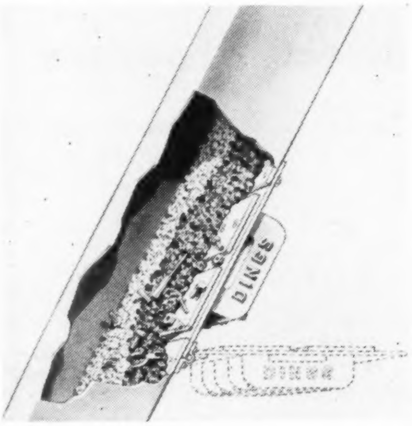
These new haulage units feature a radial gate, air-powered, to be operated either from the cab of the tractor or from the rear of the trailer. The axle and running gear design, and the full-oscillating fifth wheel are based on engineering principles developed in Easton heavy-duty side-dump mine and quarry trailers. Tires are 16:00 x 24-24 ply lug type. Brakes are 20¼ x 7, air-powered.



Trailer originally designed to haul 32 tons of coal is adaptable for the haulage of sand and gravel and other loose materials

Expand Magnetic Separator Line

DINGS MAGNETIC SEPARATOR CO., Milwaukee, Wis., has added to its line of magnetic separators by producing



Cutaway view of magnetic separator for installation in chutes

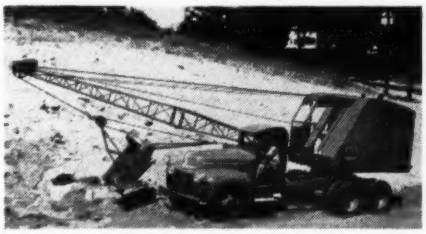
a new line of Perma-Plate magnets, designed to remove tramp iron from a flow of material traveling in chutes or ducts. Magnetic permanence is guaranteed for the life of the unit by the manufacturer. Poles of the magnet project upward from the aluminum plant on which they are mounted, aiding in mechanically arresting and holding the iron. Standard units are available from 4- to 72-in. wide.

Portable Washing Plant

DIAMOND IRON WORKS, INC., Minneapolis, Minn., is now offering two new portable plants, one that combines crushing, screening and washing facilities that produce two sizes of gravel plus washed sand; the other is designed for washing and screening only. The first, No. 1024, employs a jaw crusher, 3- x 12-ft. drag washer, 16- x 36-in. plate feeder, 8- x 8-ft. loading hopper and grizzly. The second can be fed directly from a pit by shovel or dragline and produces six sizes of washed material, employing a 3-deck vibrating wash screen. Dual pneumatic tires or steel wheels are optional with either plant.

Versatile Portable Crane

SCHIELD BANTAM CO., INC., Waverly, Iowa, is now in production of a 1/3-cu. yd. capacity unit that is convertible from power shovel to dragline, clam shell, trench hoe, piledriver or crane. This model, designed for full circle swing, mounts on any 1½ ton or larger truck, or is available on half-tracks. It is stated that capacities of 60-cu. yd. per hr. can be obtained by this unit as either a shovel or drag-

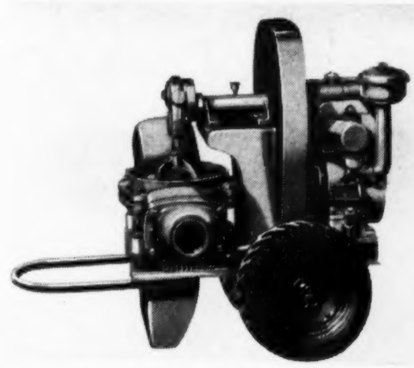


Full circle truck crane with 1/3-cu. yd. dragline bucket attachment

line; and that as a trench hoe, will dig 100-ft. of ditch 5-ft. deep per hr. Backfilling blade and other attachments are also available.

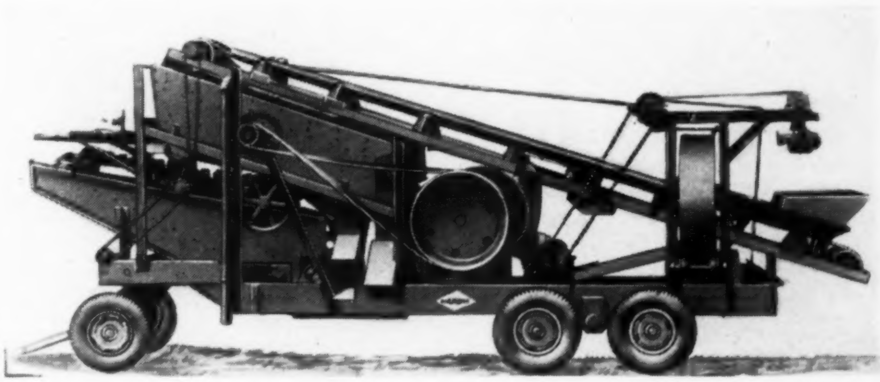
Positive Priming Pumps

BARNES MANUFACTURING CO., Mansfield, Ohio, recently incorporated a new and exclusive method of high-



Pump with high-speed, positive, priming

speed, positive, non-clogging priming in construction of its pumps in a capacity range from 3000 to 90,000 g.p.h., according to the manufacturer. A free-passage vent located adjacent to the periphery of the impeller achieves this speedy self-priming with as little as ⅓ normal water level in the pump body, it is stated. This company also manufactures a line of universal drive pumps with V-groove pulleys.



Portable plant including jaw crusher, drag washer, plate feeder, loading hopper and grizzly

A 2-cu. yd. Diesel shovel loading 11-cu. yd. bottom-dump wagons pulled by tractors

Subsidiary of Ottawa Silica Co., installs both primary and secondary crushers, and first and second screening stations on quarry floor. Increases capacity and obtains closer control over sizing of finished product

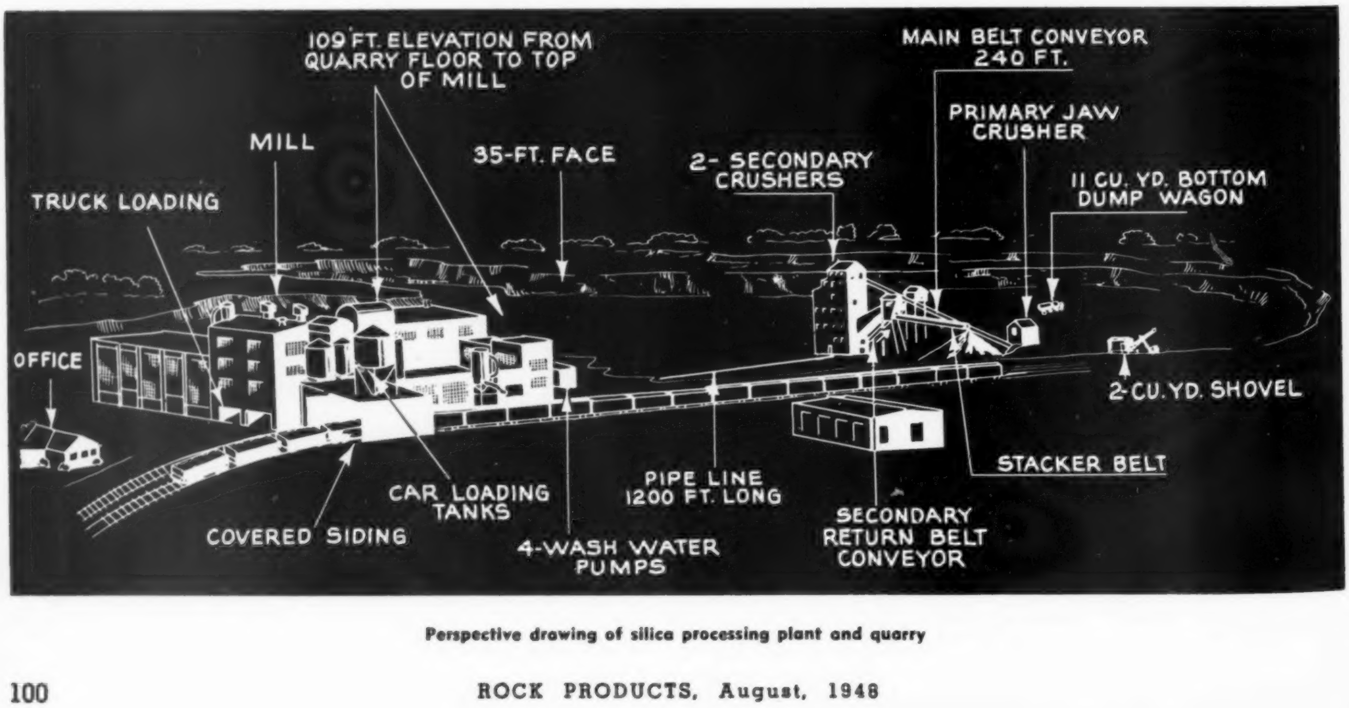
By DAVID MOCINE

MICHIGAN SILICA
Completes Three-Year Modernization Program

CHANGING almost the entire material flow in order to gain greater capacity and closer control over sizing of a clean finished product has been a three-year project at Michigan Silica Co., Rockwood, Mich., since purchase of the plant by Ottawa Silica Co., Ottawa, Ill. In order to facilitate production of both glass and foundry sand, primary and secondary crushers as well as first and second screening stations are now located in the center of the quarry floor.

Minus 28-mesh material is elevated a total of 109-ft. to the mill building, located at the edge of the quarry on ground level, by two synchronized rubber-lined pumps, operating in tandem. The 1200-ft. rubber lined pipe connecting quarry to mill performs some scrubbing action of the material thus transferred, aiding in separation of silica grains from the lime binder. Pipe line discharge at the mill is to a separator and two classifiers, operating in tandem, with no additional crushing being employed after material leaves the quarry floor. In the old plant, only the primary crusher was located in the quarry directly below the mill, with partially sized material being elevated to the mill by belt conveyor for secondary crushing as well as all screening and washing.

The Michigan formation contains a hard stone, requiring blasting and the usual quarry operations; while the Ottawa deposit requires blasting but no crushing and is mined hydraulically. Quarrying of the Michigan deposit is carried out on a horse-shoe shaped plan, with the mill being located above the rounded end of the shoe, nearly 2000-ft. from the present face being worked. Because of considerable dis-



Perspective drawing of silica processing plant and quarry

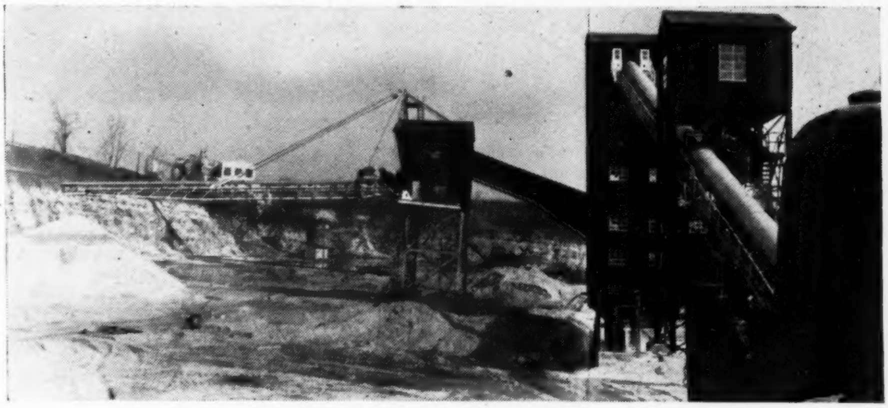
tance involved between the working face and mill as the quarry face recedes, it became economically advantageous to locate the primary sizing plant on the quarry floor. Present quarry operations extend down one side of the deposit, while over-burden is being stripped from a ledge directly opposite and equally close to the primary crusher. Overburden, averaging 23-ft. is removed and dumped back in the worked-out area between the two 30-ft. faces by a 2-cu. yd. Diesel powered dragline operated on a contract basis. The quarry is approximately 150-ft. across at this point. Michigan Silica Co. is considering purchase of larger equipment to allow the company to remove overburden and cast it further out into the worked out area without rehandling by dozer or other means.

Blast hole drilling is accomplished with a 6-in. Cyclone well drill that is mounted on a truck. Average blasthole depth is 33-ft., charged with 200 lb., 60 percent gelatin and ammonia base dynamite. Delay action blasting caps are used in conjunction with a blasting battery. The material is then loaded with 2 cu. yd. shovel. Both this unit and the dragline are new Lorain series 820, Diesel-powered, one with a Caterpillar D13000 engine and the other with a Waukesha 6, WAKD engine.

Quarry haulage units consist of two 11-cu. yd. bottom dump wagons, pulled by rubber tired Caterpillar Diesel tractors. Distance from quarry face to primary crusher at the present time is about 600-ft., requiring only one wagon to keep the plant operating at capacity, of about 1000 tons of quarry rock per day. Bottom-dump wagons discharge to a 15-cu. yd. surge hopper, from which material is fed over a 3-in. stationary grizzly set at 45 degrees by a specially designed belt feeder: 54-in. rubber belt on 8 ft. centers. This belt is 1-in. thick and rides on 9-in. diameter rubber rollers to withstand the shock of falling stone.

Oversize on the grizzly, plus 3-in. stone, is chuted to an Allis-Chalmers 32- x 42-in. jaw crusher, powered by a 100-hp. electric motor. Discharge from the crusher, minus 3-in., and throughs from the grizzly, are collected on an 8-ply, 30-in. conveyor belt on 240 ft. centers, which is pitched at 20 degrees to elevate material a total of 70-ft. to the top of the screening, secondary crusher building. No. 1 belt is powered by a 30-hp. electric motor operating through a 68.2 to 1 speed reducer, with an average capacity of 250 t.p.h. at a belt speed of 242 ft. per min.

Conveyor No. 1 discharges to a pants-leg chute for even distribution over two 4- x 12-ft. cable-suspended double deck vibrating screens, each powered by a 7½ hp. motor. A flop gate in the pants-leg chute can direct the entire flow to one or the other



View of secondary crusher and screening building from primary crusher station. Transfer house, center right; stacker belt extends to the left. Note water pipe line inclining up quarry face under stacker belt, left. Mill and loading building may be seen in the background, above stacker belt

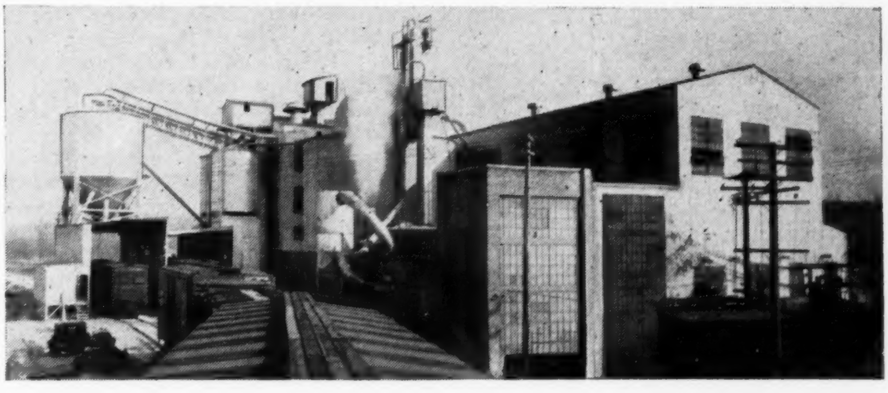
screen, so that in case of screen failure or reduced operations, the plant can operate at half-capacity. Screen cloth on the top deck of both screens is ¾-in. mesh, to protect the 5/16-in. mesh on the bottom decks. Oversize on the first and second decks of both screens is chuted half to each of two 6-in. gyratory crushers operating in parallel and set for ½-in. opening. These two crushers, each powered by 60 hp. electric motors, are Allis-Chalmers type R. Both secondary crushers discharge to an 18-in. transfer belt on 123 ft. centers for elevation to conveyor No. 1, to complete a closed circuit.

Same Belt Stockpiles and Reclaims Material

Throughs from both bottom decks, minus 5/16-in., are chuted to a 70-ton surge bin. Material is withdrawn from this bin by a 36-in. belt feeder, discharging either to a feed box for the Tyler Hum-mer wet screens or stock pile. By stockpiling partially processed material at this point in the flow, an important economy is effected in plant operation, because during the comparatively few extremely cold winter periods when frozen quarry stone has a great tendency to be difficult to process, this material is reclaimed and enables the mill to continue operating. The 24-in. stacker belt on 101 ft. centers is pivoted at the secondary building (at right angles to belt No. 1), depositing material in a semi-circle on the quarry floor. All conveyor systems in the quarry, including the stacker belt, are of Stephens-Adamson design, incorporating Goodrich belting.

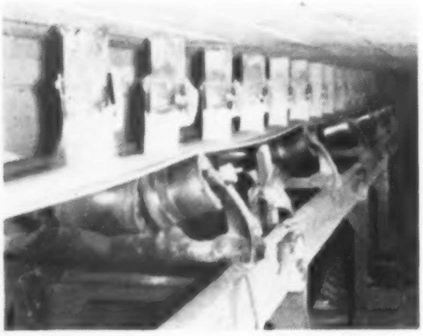
To reclaim stockpiled material, the stacker belt is lowered at the outer end and reversed, being loaded with a clamshell attachment that can be installed on the quarry shovel. Material from the reversed stacker belt is discharged to the feed box, entering it at the same point as sand from the feeder belt under the 70-ton surge hopper previously mentioned. At this point in material flow, an average of 200 g.p.m. of water is added, manually-controlled depending upon amount of material entering feed box.

Sand from the feed box is evenly distributed by a chute system over four 4- x 10-ft. single deck Tyler Hum-mer vibrating screens, two to a side, with oversize (plus 28 mesh) falling to a common trough between. As this is the first point in the flow where water has been added, the flume receiving oversize also carries a high percentage of foreign material. This flume flows to waste in the worked-

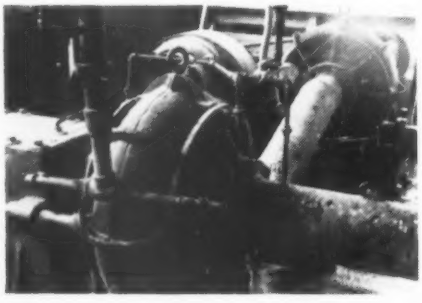


To the left is the 400-ton capacity bin for car-loading with covered conveyor belt for filling bin. Two tanks are available for different grades of sand. Directly over box car, center, is the wet-type dust collector. Elevator for elevating dryer discharge to screens. Building to the right houses drain tanks and traveling overhead crane for reclaiming drained sand

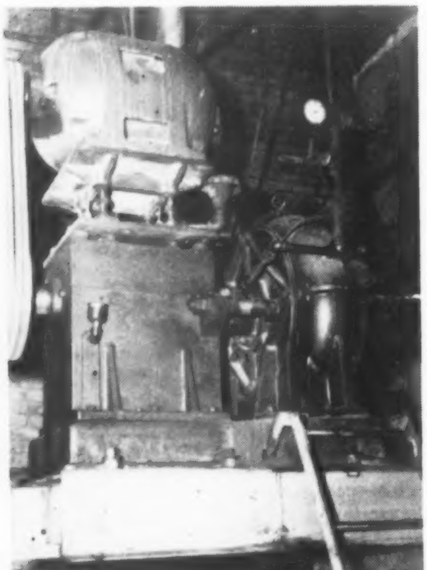
Office building located near plant



Discharge gates, manually operated, over one of two belts withdrawing finished sand from 2500-ton silo



Two of the pumps which pump 120 t.p.h. of sand to mill, 109 ft. above quarry floor. Pumps, equipped with 100-hp. motors, pump material at the rate of 12 ft. per sec. in 7-in. rubber-lined pipe



Pump which elevates classifier under-flow to drain bins

out section of the quarry. As yet, no plans have been formulated for reprocessing this material.

"Re-pulping" Troughs Allow Screen Cloth Economy

These four screens are fitted with 28-mesh slotted stainless steel cloth. Use of this more economical grade of cloth is made possible on these screens by addition half way down the deck of a "re-pulping" trough on each screen. These troughs, approximately 24 in. in width, are countersunk below screen level across the short axis of the screen. Water added to the screen at this point from 12 nozzles is directed into the trough. By this means, water is added to the screen without wear to the cloth that would otherwise result from water striking directly on the mesh with the churning action it would impart to the sharp silica particles. By the time sand and water that were introduced at the head of the screen reach the half-way point, all water has passed through the mesh. Oversize drops down into the trough where water is added, aiding any fine particles remaining to pass through the screen in its travel over the lower half of the deck.

Throughs from all four screens, minus 28 mesh, fall to a concrete pump feed box 8- x 8-ft.; 8-ft. deep. Material is drawn from this box by two rubber lined Allen-Sherman-Hoff CD Frame pumps, synchronized to operate in tandem at 895 r.p.m. and about 4-ft. apart. Both pumps are powered by individual 100-hp. motors. The line is 7-in. Spiral Weld pipe with a ¼-in. rubber lining. Velocity of flow in this pipe is approximately 12-ft. per sec., elevating 120 t.p.h. of sand and water from the quarry floor to the top of the mill building.

Classification

Flow from the quarry pipe line is discharged at the mill building to a 28-ft. hydro-separator, 7-ft. deep, in a ratio of 30 percent solids to 70 percent water. This separator and two rake classifiers that follow it, operating in tandem, are of Dorr manufacture. Discharge from the separator is chuted to a 12- x 28-ft. rake classifier. About 400 g.p.m. of make-up water added at this point makes concentration of underflow from the separator approximately the same as feed from the quarry pipe line. Underflow from the first rake classifier, 70 percent solids, falls to the second rake classifier, at which point make-up water is again added for more washing. A continuous graph chart, mounted on a bridge over the basin of the separator, is activated by a torque recorder connected to the rake agitator, giving the amount of solid material in the basin of the separator at all times. Overflow from all three units, impurities and water, is piped to waste.

Discharge from the final rake classifier, to which water is again added, falls to a concrete hopper box 12- x 4-ft., 5-ft. deep, for pump feed. This pump, similar to the two in the quarry but powered by a 40 hp. motor, elevates the material 30-ft. to one of three circular reinforced concrete drain tanks of 1000 tons capacity each. A normal day's operation fills one tank, allowing two days drain time before the sand is transferred to the dryers. As the level of sand in the tank being filled raises, 6-ft. sections of wood cover are placed over a vertical trough in one side of the silo, providing means for immediate drainage of surplus water. Bottom of the tanks are formed by wood slats resting on a fill of cinders, sand, gravel, etc.

Sand is reclaimed from the drain silos by a traveling overhead crane using a 1½-cu. yd. clam shell bucket, which deposits the sand in a hopper at one end of the tanks for gravity flow to a short 24-in. transfer belt. From the transfer belt, material falls to a 24-in. belt on 40 ft. centers extending over three dryer feed-hoppers. Dual electric controls to start or stop this transfer system can be operated from the crane cab or the superstructure over the feed hoppers. Two plows that are positioned by remote control over either of two hoppers plow sand off the belt into either hopper. Feed for the third hopper falls directly over the end of the belt conveyor without a plow being needed.

Material from the feed boxes is delivered to three 6- x 34-ft. oil fired Rotary, indirect heat Ruggles-Cole type dryers by 16-in. belt feeders. Dryers operate 24-hrs. per day on a 7-day week, with the balance of the plant operating on an 8-hr., 6-day week. No. 6 preheated fuel oil is used. Thermocouples are located in the discharge stream, for recording sand temperatures.

Totally Enclosed Vibrating Screen and Feed Boxes

A bucket elevator on 66-ft. centers, located at the discharge end of the middle dryer, receives sand from each of the two outside dryers by means of two Jeffrey electro-magnetic pan feeders, operating in tandem, under each dryer. The first elevator, powered by a 15-hp. motor, transfers sand to a second 21-ft. elevator, powered by a 5-hp. motor, for final elevation to a screening station mounted on top of the finished sand storage silo. The second short elevator was made necessary when three Tyler Hum-mer single deck vibrating scalping screens, operating in parallel, were located over the silo in revamping the plant. Discharge from the short elevator is chuted to the three 4- x 10-ft. screens, operating in parallel, which are fitted with feedboxes that distribute the flow evenly over the entire width of the screen and at the same time create an

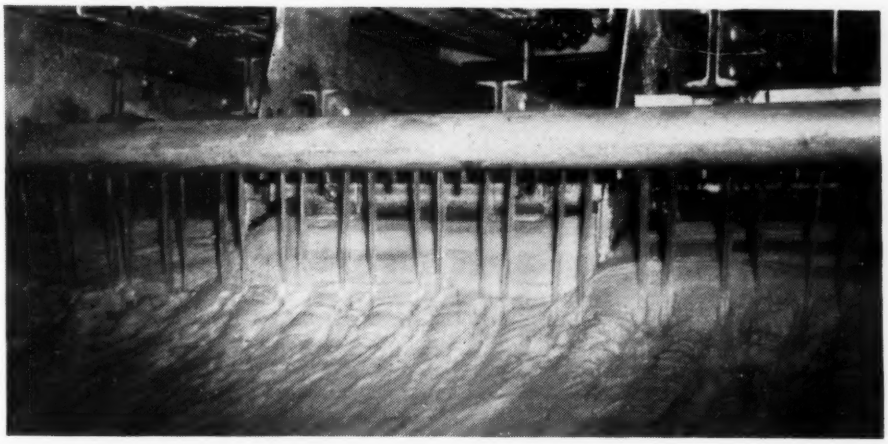
even feed, minimizing material surges. These feed boxes, attached to all totally enclosed screens in the plant, are as wide as the screen, and approximately 10 in. deep by 20 in. high, rising vertically at the head end of the screen. These feed boxes contain a movable plate, pivoted at the back of the box, that may be tilted at any angle to increase or decrease the flow. As the sand enters the box through a pipe at the top, the plate acts as a dam or weir, with sand overflow spreading evenly over its length before falling to the screen.

Oversize from these three vibrating screens, plus 32 mesh, is chuted to a 35-ton truck hopper and sold as coarse sand blast sand. Throughs are chuted to a 2500-ton reinforced concrete silo directly beneath the screens for storage. Sand is reclaimed from this silo by two 16-in. belt conveyors on 35 ft. centers, operating in parallel. These belts are fed by 12 manually operated clamshell gates each, extending in parallel lines across the 34-ft. diameter of the bottom of the silo. According to R. S. Lebold, plant manager, the 24 gates aid in preventing segregation of the material fed to the belt, which would not be the case were only one or two large gates used at the center of the storage silo. Each of these belts feed a bucket elevator on 56 ft. centers which discharges to a common pants leg chute at the top of the building. A flop-gate at this point is used to divert all or any part of the flow to a 24-in. covered conveyor belt on 75 ft. centers which transfers the sand to a 500-ton capacity overhead tank at siding No. 2 for rail car loading.

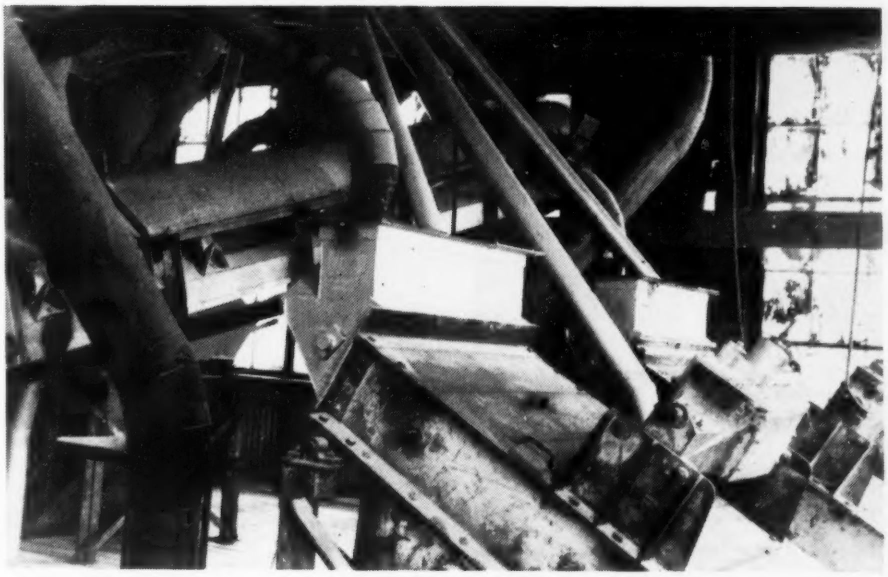
Alternate flow at the flop gate to sending all the sand to the conveyor belt is to send any part of the flow to eight 3- x 5-ft. totally enclosed Tyler Hum-mer vibrating screens. These screens are fitted with 50-mesh screen cloth, with oversize and throughs being chuted to separate bucket elevators on 56 ft. centers for elevation to two tanks at siding No. 1.

Train Car Loading

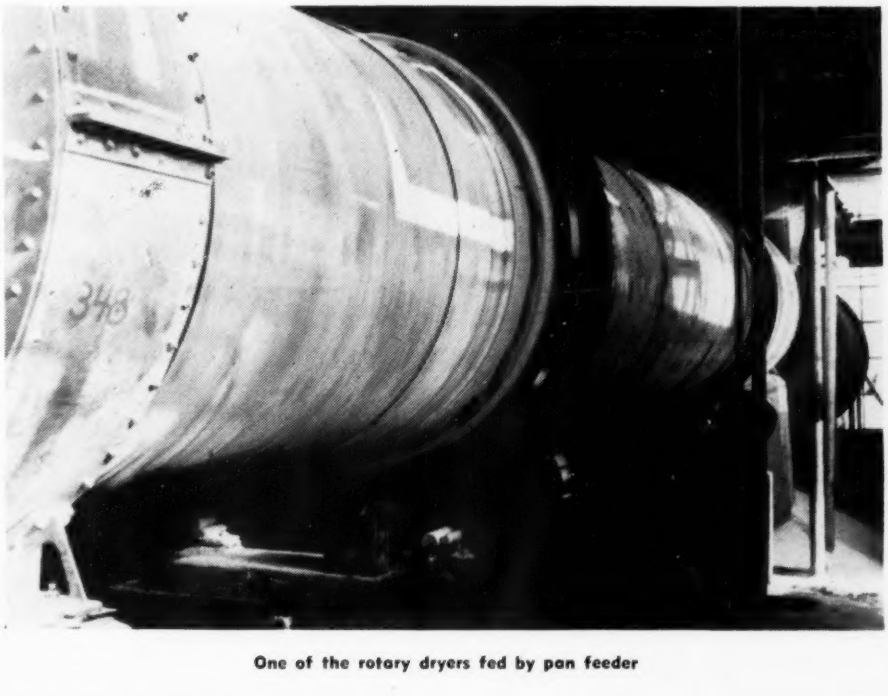
Sand from either tank at siding No. 1 may be discharged through a 10-in. metal tube direct to covered top hopper cars or to a portable belt loader for box-car loading or may be discharged through a manually operated two-spout bag packer. The larger tank at siding No. 2 is fitted to load either covered hopper or box cars. Two clamshell gates, manually operated through a lever, arm device, are provided on the bottom of the tank over the siding for covered hopper car loading. A tube for connection to the car being loaded under one gate is mounted on an overhead track system so that it can be moved out of line to allow passage of box cars; while the other gate is fitted with a tube mounted on an extension arm. Box cars at siding No. 2 are



Discharge from first of two rake classifiers



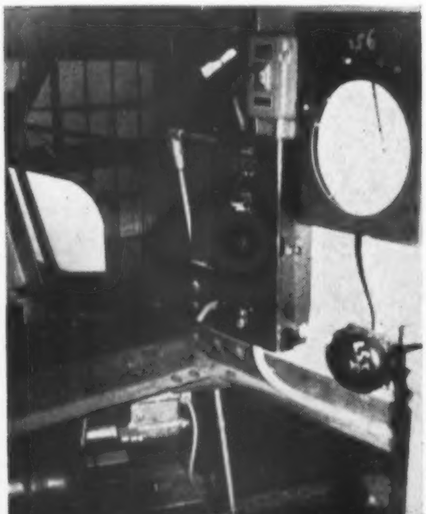
Totally enclosed electro-magnetic screens for finished product. Note feed box, dust control piping, and covered conveyor, background, inclining up to carloading bin outside of building



One of the rotary dryers fed by pan feeder

Hydroseparator in background with cat-walks at right angles to two rake classifiers

Short 36-in. belt feeder, directing flow either to stacker belt or feed box for addition of water for pumping to mill



Continuous recorder on bridge over hydroseparator. Instrument activated by torque recorder on rake agitator of separator bowl. Note alarm bell for warning of too high a load

loaded with a 16-in. belt on 10 ft. centers that is mounted on a three-arm extension for ease in placing inside cars to carry sand to either end. Material from the bin overhead is fed to the conveyor through a 10-in metal pipe that is swung in through the car door. This loader enables one man to load an average box car in 30 minutes.

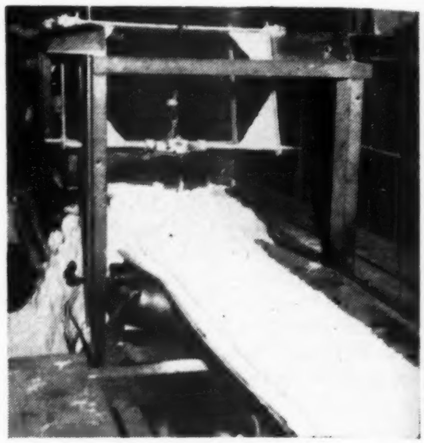
Largest production at this plant is of glass sand, which is shipped in both covered hopper and paper-lined box cars. Glass, foundry and ceramic sands from this plant are used in all types of manufacture. All sand is shipped in railroad cars. Only shipment by truck is the comparatively small amount of sand blast material produced. Sand from the Michigan deposit is white, high in silica content, low in iron content, and characteristically round in grain shape. Sand from the Michigan plant does not contain as wide a variety of grain sizes as the Ottawa product.

Pumps For Process Water Quarry Drainage

Two 1200-g.p.m. Union pumps, powered by 50-hp. motors, and two 1000-g.p.m. Ingersoll-Rand pumps, powered by 40-hp. motors, are located in the low worked-out section of the quarry directly below the mill building. Two pumps are in constant use providing processing water for the plant and two are held as stand-by units or to pump excess seepage water from the quarry over to a small river 500 ft. distant.

Two C. B. Schneible high-velocity, wet-type dust collectors are employed in the plant, with one serving the dryers (1500 c.f.m. fan exhaust), and the other serving the dry screens and the covered conveyor belt to the 500-ton car loading tank (2400 c.f.m. fan exhaust).

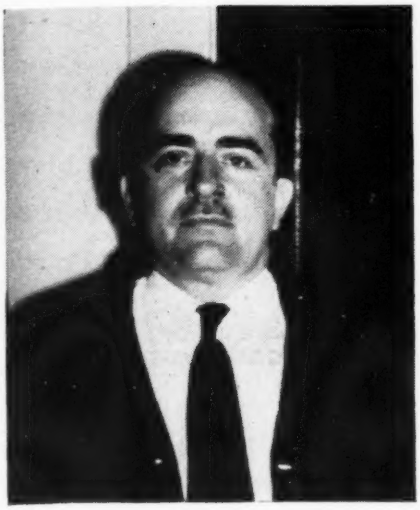
All totally enclosed screens and the



Sand from drain tanks being plowed off 24-in. belt on 40-ft. centers into one of three dryer feed boxes

four wet screens in the quarry fitted with "re-pulping" troughs are of the Tyler-Hum-mer manufacture. Cloth on all screens is of W. S. Tyler make. The two cable suspended double deck screens in the quarry plant are Allis-Chalmers Ripl-Flo. Force-feed grease system for the jaw crusher is of Trabon design, while the two gyratories are lubricated with the system produced by Allis-Chalmers. Two Caterpillar D-7 dozers are used for clean up work in the quarry, one at the quarry shovel and the other at the dragline. Quarry haulage equipment is of Caterpillar manufacture. In dry weather, a Bucyrus-Erie scarifier, pulled by one of the tractors, is used to loosen overburden for the dragline. All conveyors in the quarry plant are powered by Allis-Chalmers motors through Foote Bros. and Stephens-Adamson gear reducers, and are controlled by Allen-Bradley equipment. The recording device on the hydroseparator is of Brown Instrument Co. design. Sand is reclaimed from the

Discharge end of dryer showing electro-magnetic pan feeder. Thermocouple records temperature of sand



Ralph S. Lebold, plant manager

wet storage silos by a Blaw-Knox clamshell suspended from a Northern traveling crane.

Michigan Silica Co. began small scale operations at this site in 1905, selling to Ottawa Silica Co. in 1944. In a modernization program that has revamped the entire operation, major change has been the re-locating of primary and secondary crushers in the quarry, plus first and second screening operations. Next in importance is the emphasis placed on the use of separators and classifiers in the mill building. At the present rate of production, it is expected that the deposit now being worked will continue to yield high-grade silica sand for at least two or three generations. Life expectancy of the deposit, scarcity of high-grade silica formations in the United States, coupled with activity in glass plants, foundries and other related industrial activities made complete modernization of this plant economically feasible.

Officers of Michigan Silica Co., are: G. A. Thornton, president and general manager; H. C. Thornton, vice-president and treasurer; F. Lewis, secretary; and R. S. Lebold, plant manager.

Portland Cement Production

PRODUCTION of finished portland cement in April, 1948, totaled 16,041,000 bbls., as reported to the Bureau of Mines. This is an increase of 10 percent over that reported for April, 1947. Mill shipments reached 19,047,000 bbls., an increase of 24 per cent above the April, 1947, figure. Stocks of 17,880,000 bbls. on April 30 were 16 percent below the April, 1947, figure. Clinker output in April, 1948, reached 16,050,000 bbls., an increase of 7 percent over the corresponding month of the previous year.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	April 1948	April 1947	Mar. 1948	Feb. 1948	Jan. 1948
The month	80.0	74.0	71.0	70.0	71.0
12 months	78.0	73.0	79.0	79.0	78.0

Ohio Ready Mix Meeting

Better public relations by training safe and courteous drivers emphasized at recent meeting in Cleveland

KEYNOTING the annual Ohio Ready Mixed Concrete Association meeting at the Cleveland Hotel, Cleveland, June 24, was the statement that improved public relations are the answer to restrictive laws recently enacted in some municipalities. In opening the meeting RALPH H. ANDERSON, W. E. Anderson Sons Co., Columbus, president, said: "Our public relations are weak. We must educate our drivers to be courteous and safe drivers—if we don't we will be faced with increasing adverse legislation. Let's give a little time to public relations and safe driving, and not devote all our time to sales and engineering."

STEPHEN STEPANIAN, Arrow Sand & Gravel Co., Columbus, treasurer, read his report concerning association finances for the past year, followed by the report of the auditing committee. CLAUDE CLARK, executive secretary of the association, gave a brief but comprehensive summary of official activities for the year just ended, touching on the following subjects: Bond issues that had passed, and what the membership might do to assure even more passing the electorate in the next year; the present building boom, coupled with the increase in the use of architectural concrete construction and what this should mean to members (this last was taken from an official paper prepared by the Portland Cement Association). Active participation by the association office, jointly with the National association on national legislation and locally with regard to state legislation, in the interest of the ready mixed concrete industry, was also outlined. Mr. Clark concluded his remarks with the statement that 12 new members had been added to the association during the past year, bringing total active membership to 75. Total associate membership is 17 companies.

V. P. AHEARN, executive secretary of the National Ready Mixed Concrete Association, Washington D. C., in his address, reviewed the effect of the recent U. S. Supreme Court ruling on the cement basing point price system. Mr. Ahearn touched briefly on the various laws alleged to have been violated by the system, and said 50,000 pages of testimony had already been taken in the case. He pointed out that if the letter of the law were carried out, it would spell disaster for the ready mixed concrete industry. If cement were strictly mill-priced, it would mean a dollar or more per bag increase in cement prices. But he cautioned members against any action now, as the directive was still to be issued by the circuit court of appeals, and until the directive was actually issued, no one knew just how it would be worded. Mr. Ahearn also mentioned that Congress was interesting itself in the case, and if the new ruling proved a hardship for small business, some remedial action would probably be taken. Also discussed were recent decisions interpreting labor laws; followed by questions from the floor.

Operating Problems

Under the head of "Discussion Topics" the problem presented by inconsistencies of testing laboratories was discussed, with a brief presentation by JULIUS WARNER, Richter Concrete Co., Cincinnati. The talk was confined to actual experiences in an effort to show that such inconsistencies as appear in end results most frequently arise from incorrect procedures all along the line: from improper filling

(Continued on page 109)

Newly elected officers and directors: Left to right: Stephan Stepanian, Arrow Sand & Gravel Co., re-elected treasurer; Claude Clark, secretary; Ralph Anderson, retiring president; M. Paul Hunt, Millard-Hunt Co., vice-president; R. P. Mumford, Beckley & Myers Co., president; and directors, C. A. Persons, West Side Lumber & Coal Co.; Samson Crew, Crew Builders Supply Co.; and Samuel Frowine, Portsmouth Mixed Concrete Co.

Secondary crusher station, to the left; loading station in the center, and storage to the right

Superior Stone Co., Raleigh, N. C., constructs new plant at Red Hill, Va., at foot of mountain to take advantage of gravity flow of materials from primary crusher, above

By E. LEE HEIDENREICH, Jr.*

SURGE STOCKPILE Cuts Plant Delays

To REPLACE an old plant that had become obsolescent, the Superior Stone Company of Raleigh, N. C., constructed a new plant at Red Hill, Va., which was completed in 1947. In 1946, W. T. Ragland, president, and E. U. Ragland, vice-president of the Superior Stone Company decided that more productive capacity was required at Red Hill. A better quarry site also was sought because there were numerous clay seams in the deposit then being worked. After considerable examination of neighboring properties and core drilling of some of these properties, a location was decided upon about one mile south of the original plant.

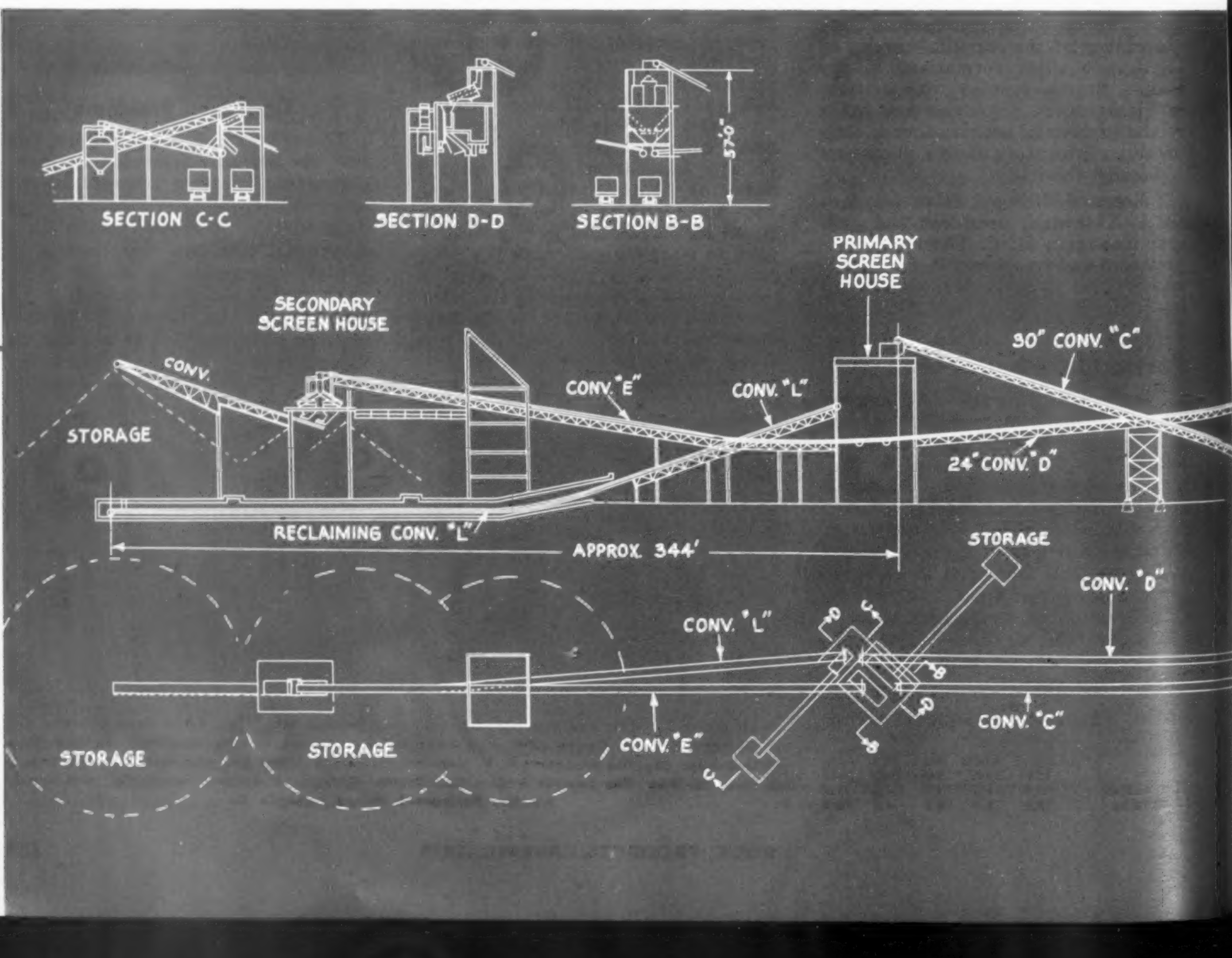
This new location was a mountain about 500 ft. high. After surveys had been made, a railroad lay-out was prepared which required 3500 ft. of track to the proposed plant location. This railroad track was laid out to have about a 1% up-grade from the main line of the Southern Railway, and 2000 ft. of single track and 3000 ft. of double track was installed to allow for 1500 ft. of double tail track. The plant site was then graded and work on opening the quarry was started, the quarry floor being located 185 ft. above the plant site elevation and about 200 ft. below the maximum height of the mountain.

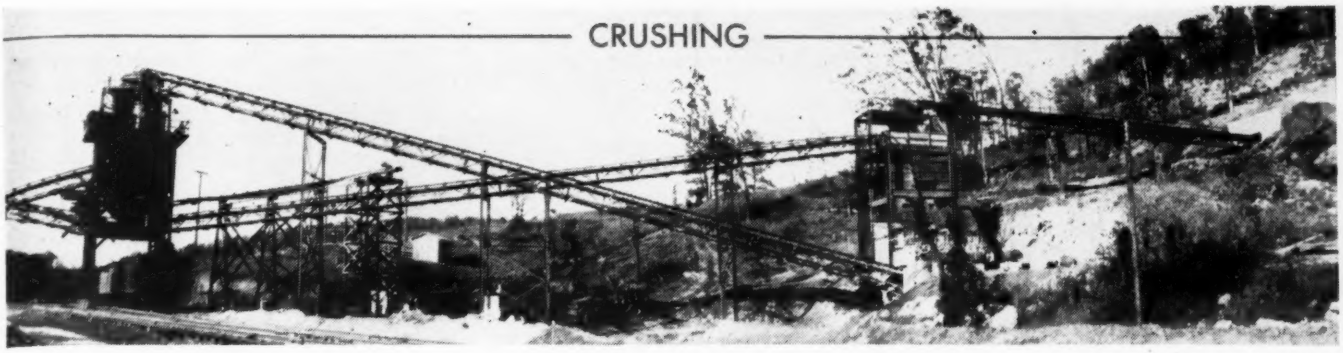
*Consulting Engineer

Drilling and Blasting

Primary drilling for opening the quarry was done with wagon drills

Plan and elevation details of screening, and storage facilities





Overall view of conveyor system connecting crusher and screening stations

and snake holes until a face 35 ft. high was obtained. The mountain side slopes upward at an angle of 27 deg., and thus the face rapidly increases in height. At the present time the face has a length of about 1200 ft. Sanderson-Cyclone well drills are now being used for blast hole drilling. Stone for the new plant is loaded by two $2\frac{1}{2}$-cu. yd. shovels, and transported by Euclid and Easton semi-trailers to the primary crusher. At the primary crusher, a 42-in. Allis-Chalmers gyratory, the stone can be dumped on two sides by the two semi-trailers and on the other two sides by the Euclid dump trucks. A 40-ton steel stiff leg derrick installed for the erection of this crusher will be used in the future to service it and handle any crusher jams as they may occur.

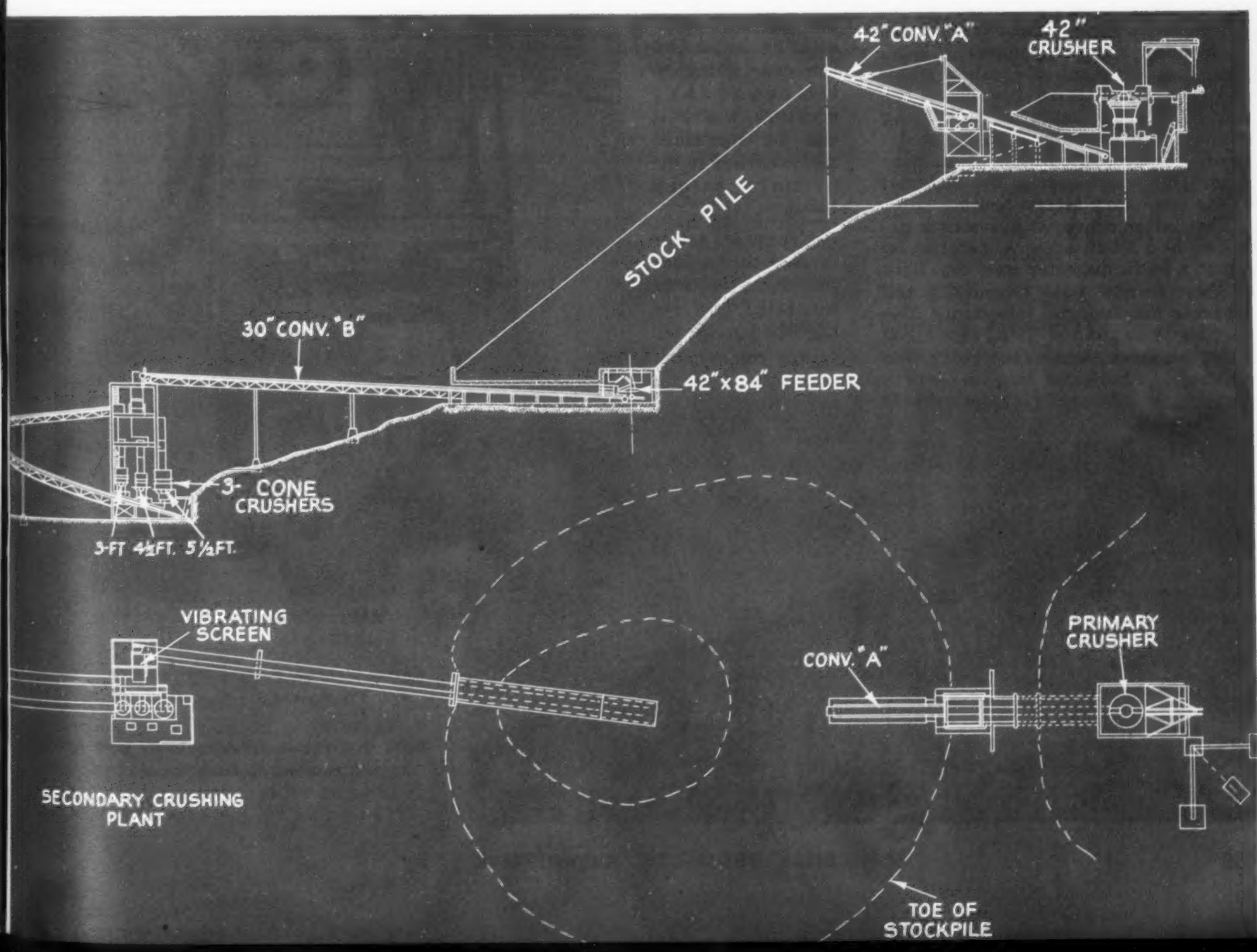
Crushing and Screening

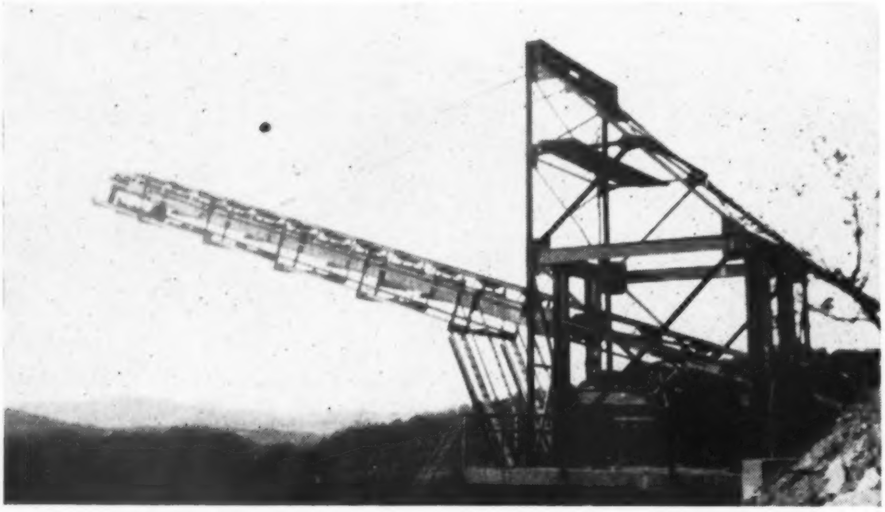
This 42-in. gyratory, which is set at about a 6-in. opening, discharges onto a 42-in. conveyor belt (A) which in turn discharges onto a storage pile on the hill side. This primary storage pile has a capacity of over 20,000 tons of stone.

Under the storage pile is a tunnel with a 30-in. conveyor. The stone is fed from the storage pile onto this conveyor by 42 x 84 in. Syntron feeder. This 30-in. conveyor transports the stone to the secondary crushing station where it is discharged over a 6 x 10 Robins Gyrex two-deck scalping screen. The material from the top deck of the screen goes into a small bin, and from there into a $5\frac{1}{2}$-ft. cone crusher. The material from the second deck goes into another bin and thence to $4\frac{1}{4}$-ft. Symons cone crusher, the material passing the second deck by-passes the crushers and goes to a 30-in. conveyor (C) onto which both of the before-mentioned crushers discharge. This latter conveyor transports the stone to the primary screen house, and the over-size material is returned from this screen house by a 24-in. conveyor (D) to a third Symons cone crusher, the latter being a 3-ft. machine and located alongside the other two crushers.

At the primary screening station, there are two 5-x 12 ft. Robins Vibrex triple A-deck screens. Over-size from these screens is returned for re-crushing as before mentioned. The material between the first and second decks discharges into a bin which is known as

Showing primary crusher, surgepile, and secondary crushers





Primary crusher boom conveyor to crusher run stockpile

the ballast bin, and from there over a rinsing screen direct into cars. Before rinsing, it can be discharged onto a conveyor and conveyed to a storage pile. This material also may be discharged onto the over-size conveyor and returned to the crushers for recrushing. This material will be minus 1⅝-in., plus 1⅛-in. The minus 1⅛-in., plus ¾-in., which goes into a second box chute and from there over the rinsing screen direct into cars, can be blended with the previously mentioned size and used for ballast. The minus ¾-in. goes into a third box chute where it can be loaded direct into cars as run-of-crusher material, or blended with the minus 1⅛-in., plus ¾-in. for run-of-crusher material. From this third box chute the run of crusher material, all being minus 1⅛-in. or minus ¾-in., as desired, discharges onto a 24-in. conveyor (E) which carries the material to the secondary screen house.

This latter conveyor discharges onto two 5- x 12-ft. screens installed on top of a 24-ft. diameter steel bin. Both of these screens have two decks, and separate the material into minus 1⅛-in., plus ¾-in., minus ¾-in., plus ¼-in. material, these sizes either going into the silo, or are stored around the outside.

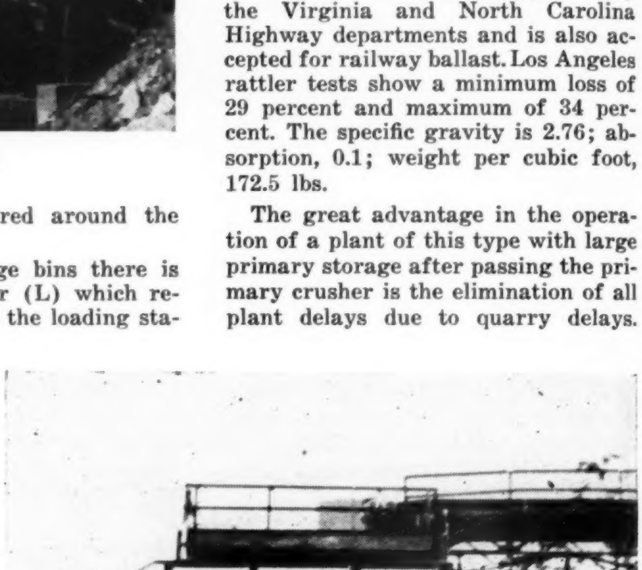
Under these storage bins there is a reclaiming conveyor (L) which returns the material to the loading station adjacent to the primary screen house. Here the material is rinsed over a screen and loaded to cars. This reclaiming conveyor is so arranged that this material can by-pass the rinsing screen and discharge onto the conveyor going to the secondary crushers where it can be recrushed and returned to the primary screen house.

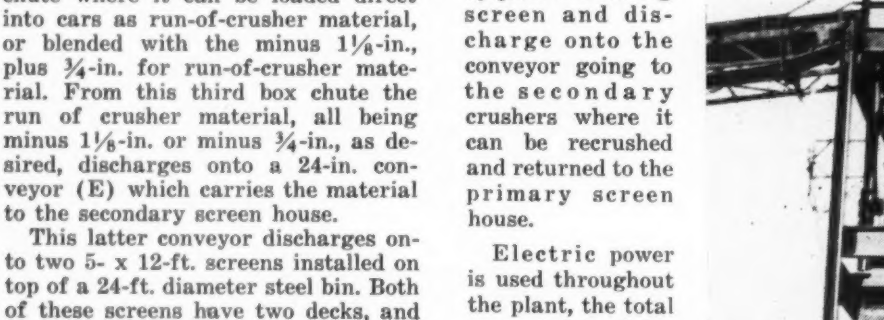
Electric power is used throughout the plant, the total connected load being 920 h.p. Water supply comes from the adjacent Hardware river about 1000 ft. west of the plant.

Quarry and plant property consists of about 454 acres of which over 200 acres are mountain lands. The greater part of the mountain is bare rock, and no real stripping is required. Where there is an overburden of brush and trees there is a maximum of 2 ft. of overburden.

The rock is a Lovington granite gneiss, consisting of biotite-quartz menzonite; augen gneiss; intrusive in Lynchburg gneiss and hornblende gabbro. This rock has been approved by the Virginia and North Carolina Highway departments and is also accepted for railway ballast. Los Angeles rattler tests show a minimum loss of 29 percent and maximum of 34 percent. The specific gravity is 2.76; absorption, 0.1; weight per cubic foot, 172.5 lbs.

The great advantage in the operation of a plant of this type with large primary storage after passing the primary crusher is the elimination of all plant delays due to quarry delays.





Above: Close-up of three cone crushers, 3-ft., 4½-ft., and 5½-ft. respectively

Left: Quarry face following blast. Note how drills are operated, above

When the shovels are in good digging, 600 t.p.h. can be produced by the primary crusher, and breakdowns in the quarry will in no way effect the operation of the screening and sizing plants as long as the material remaining in the primary stock-pile is available. If for any reason the quarry operations are broken down and delayed on account of bad weather in winter, the screening and sizing plant with the secondary crushers can operate over a week's time without loss of production. Plant capacity is 350 t.p.h.

R. C. Williams is plant superintendent, and Pete Wallenborm is plant manager. The plant was laid out and designed by E. Lee Heidenreich, Jr., consulting engineer, of Newburgh, N. Y.

V. P. Ahearn, left, and Stephan Stepanian, in a huddle over some problem

Ohio Ready Mix Meeting

(Continued from page 105)

of test cylinders to faulty handling of concrete specimens in the laboratory proper. Mr. Warner pointed out that he felt that no one in the industry questioned the integrity of testing laboratory personnel—but that he did feel that a closer adherence to A. S. T. M. specifications and recommendations, particularly by new field employees, would erase a high percentage of these avoidable inconsistencies.

A second discussion led by Mr. Warner was concerned with unloading bulk cement from covered hopper cars. Two members, working separately on the problem, arrived at practically the same solution. This consists of fluffing or fracturing the packed cement by introducing a ⅜-in. pipe attached to an air-hose into the mass, allowing periodic blasts of air to issue from the end of the pipe or through small holes bored around its perimeter. By increasing the flow of cement from the car, capacity operation of screw conveyors and/or bucket elevators of the cement recovery system is assured, which makes for efficient operation of such equipment.

R. P. MUMFORD, Beckley & Myers Co., Springfield, vice-president, led a discussion on handling of additives. Though listing five different types of admixtures in common use, the discussion was confined to air entraining agents and accelerators. It was brought out that accurate measurement was of primary importance in the addition of any air entraining agent, with a different quantity required for every individual type of mix. When speaking of accelerators, Mr. Warner pointed out that though calcium chloride (the principal ingredient in any commercial accelerator compound) could best be added in a water solution, this became next to impossible with the average transit-mix truck, water tank combination. A very satisfactory answer to this problem was the use of the flake-type additive, put into the mix at the same time as the aggregate, he said.

Mr. Anderson discussed the problem of dust collection at the batching plant, outlining a system that had been found to work well at his plant. A Sly bag-type dust collector in use at the W. E. Anderson Sons Co., Columbus, plant recovers an average of 100 lbs. of cement dust per 100 tons of concrete batched. Mr. Anderson emphasized the point that the removal of this much dust from the air was a tremendous step forward in the direction of better public relations with those both living and working in the immediate vicinity of the batching plant.

What's Doing in Washington

Guest speaker at the annual banquet was V. P. Ahearn who gave his views on "What's Doing in Washington." Five major points of Mr. Ahearn's address were: 1) It will be at least two years before the transportation crisis or car shortage will be in any way alleviated. This car shortage has severely restricted amount of heavy construction; and will continue to do so for two or more years to come. 2) Freight rates are apparently going still higher this year. 3) There is a growing cement shortage in certain geographic sections of the country; and these will be aggravated if mill-priced cement becomes a certainty. 4) Voluntary allocation has not worked, for the most part, and so some stronger bills are awaiting the return of Congress this fall. 5) The last draft found the nation with a cushion of unemployed on the labor market, but the new draft law comes at a time of labor shortage. As a result, Mr. Ahearn suggested that it would be a good idea now to look around the plant and find what places would be suitable for employment of women or physically handicapped persons.

Last piece of business before adjournment was the naming of officers for the coming year by the nominating committee, appointed in the morning session. Those nominated and subsequently unanimously elected were: R. P. MUMFORD, president; M. PAUL HUNT, Millard-Hunt Co., Marion, vice-president; and STEPHEN STEPANIAN, re-elected treasurer. C. A. PERSONS, West Side Lumber & Coal Co., Elyria; SAMSON I. CREW, Crew Builders Supply Co., Norwood; and W. SLOTER, F. W. Sloter Co., Columbus, were elected as new members of the board of directors. SAMUEL E. FROWINE, Portsmouth Mixed Concrete Co., Portsmouth, was elected to fill Mr. Hunt's unexpired term on the Board.

Immediately following the election of officers, the meeting adjourned—to reconvene at the ball park. Attendance at the morning meeting and luncheon was 117, including members, prospective and associate members, equipment representatives and a group representing P. C. A. Of this number, 90 attended the afternoon ball game at Cleveland Stadium between the New York Yankees and the Cleveland Indians. Attending a ball game as highlight of the annual convention entertainment is a tradition which the Ohio Ready Mixed Concrete Association has recognized annually since the first game attended four years ago when the late Clarence Ehle was president of the association.

Ralph H. Anderson of W. E. Anderson Sons Co., retiring president

To Sell or Lease Quarry Property

W. H. ISBELL has announced plans to lease or sell his limestone quarry at McGregor, Iowa. The site is reported to be suitable for production of cement, and has a mountain of shale a mile south where the Southern Railroad runs through a cut 90 ft. thick.

Recently Congress authorized a canal to run from Aberdeen, Miss., to Pickwick Dam on the Tennessee River, as part of the TVA delevopments, and an appropriation of $1,500,000 for preliminary work has also been authorized. Some 300,000 bbls. of cement, and large amounts of crushed aggregate for concrete work will be needed.

Recently Mr. Isbell leased a second quarry at McGregor, Iowa, to E. C. Schroeder Co., Inc., which company has a contract to furnish a million tons of riprap for two government dams near Grenada, Miss.

PROBLEMS

Facing the Cement Industry

Cement manufacturers striving to overcome cement shortages; do not believe competition from imported cement a threat at this time

By BROR NORDBERG

AVAILABILITY of cement supply apparently will continue a major problem of the construction industry at least through 1948, and likely throughout 1949 in certain areas, according to our own estimates, the observations of cement users in many localities and the opinion of the portland cement industry itself. For the purpose of a summary of conditions affecting supply, we asked the chief executives of portland cement companies to tell us about the supply situation and to outline what their companies are doing and plan for the near future in order better to meet demands. We also sought opinion on the possibility of greater importation of foreign cements, should reciprocal trade treaties be further liberalized by the establishment of rates more favorable to import. Our comment herein is largely based upon generous and frank replies to our letter, for which we are sincerely appreciative.

Production Estimates

Production of portland cement and shipments in 1947 were 14 per cent and 11 per cent over 1946 figures, respectively. Both figures were all-time records for the industry. Shipments are now running well ahead of 1947 figures and new records will have been established by the year end. Individual companies estimate an average increase of ten per cent for shipments in 1948 from established manufacturing plants. Shipments for some companies have been running as much as 30 per cent higher for the first six months this year than for the comparable period in 1947 but those companies report that stocks on hand are much lower. For the industry, average shipments will increase 13 million barrels over 1947 figures according to conservative estimates, which will bring the total to 200,000,000 bbl. Some new capacity is scheduled to come into production in 1948.

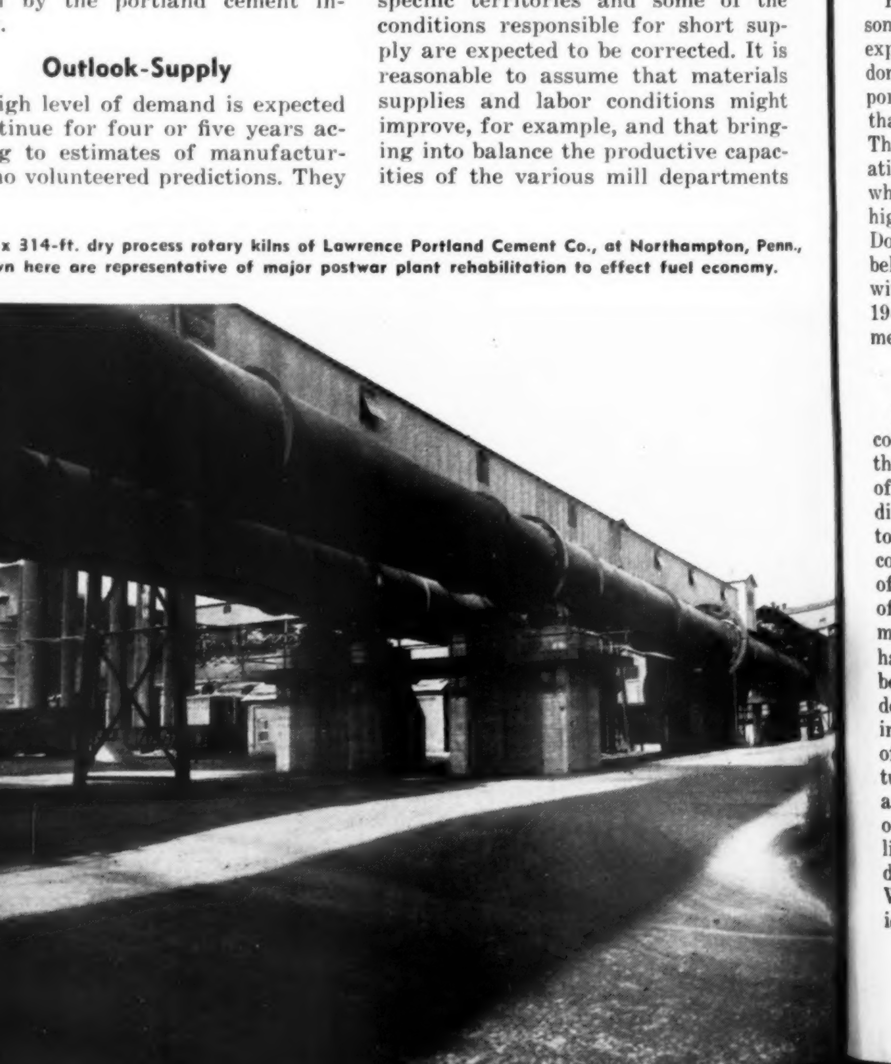
Present volume of shipments represents, for the first time since World War I, capacity operation of the industry, which of course does not equal capacity that would be available if there were not so many serious deterents to continuous, high level production. We refer to strikes in supporting industries, including John L. Lewis' bituminous coal industry, shortages of materials and skilled labor, poor quality of materials and other factors that diminish potential capacity and which are beyond any control by the portland cement industry.

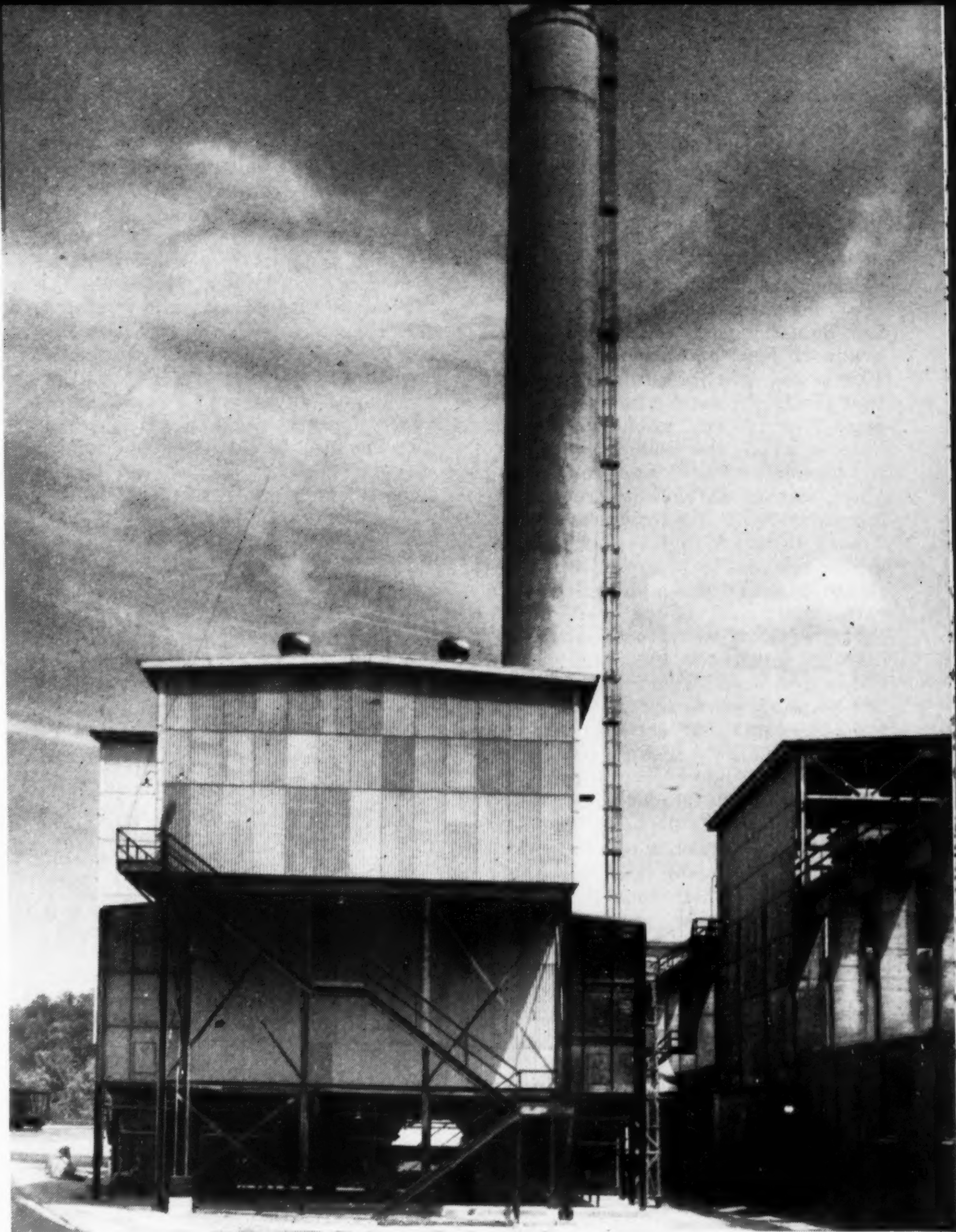
Outlook-Supply

A high level of demand is expected to continue for four or five years according to estimates of manufacturers who volunteered predictions. They qualified their estimates in event of major events, such as war, which can of course re-shape the entire nation's economy, but even in such event believe that demand may continue heavy because of accelerated needs for highway construction and the building and enlargement of airports.

Cement manufacturers tend to minimize the seriousness of the cement shortage as reported from outside sources but their comments largely reflect conditions in their own marketing territories. Some good reasons are set forth for shortages that exist in specific territories and some of the conditions responsible for short supply are expected to be corrected. It is reasonable to assume that materials supplies and labor conditions might improve, for example, and that bringing into balance the productive capacities of the various mill departments

Two 9- x 314-ft. dry process rotary kilns of Lawrence Portland Cement Co., at Northampton, Penn., shown here are representative of major postwar plant rehabilitation to effect fuel economy.





High recovery of valuable materials from kiln exit gases is attainable from installations like this electrical precipitator at Universal Atlas Company's Leeds, Ala., plant

will add substantially to plant capacities. The industry expects that general shortages, except in territories isolated with respect to available supplies of cement, will be largely alleviated within a year or two.

Large corporations with widely scattered mills report that the supply of portland cement available for the amount of construction work undertaken is generally adequate with the exception of some local shortages of anticipated short duration. Exceptions are mainly in the South and in the Rocky Mountain States. In the latter region, new production will help alleviate a situation that has been extremely critical. Florida, parts of Louisiana, Texas, Southern California and the sparsely populated States including New Mexico are areas where supply at the present time is far short of demand. Even in these areas (New Mexico) we hear of cases where portland cement is being shipped in at attractive prices from the Lehigh Valley where supply reportedly exceeds demand and some manufacturers are actually looking for business.

Plants on the East Coast have, in some cases, withdrawn entirely from export sales in order to improve the domestic supply situation but total export volume remains relatively higher than it has been the past several years. This has come about because of limitations in storage at individual mills which desire to keep operations at a high level practically the year around. Domestic demand, in these cases — believe it or not—has not kept pace with winter production of cement. In 1947, some 8½ million barrels of cement were exported.

Factors Limiting Supply

It is the opinion of many cement company executives, and ours, that there are instances where shortages of cement supply are exaggerated or distorted, to pass the buck for failure to complete needed construction. Much construction is being deferred because of high costs and not because of lack of cement. Shortages of other building materials, among them plaster, nails, hardware, electrical equipment, lumber, etc., are responsible for a great deal of the delay in completing housing construction and they are felt often after the foundations have actually been placed. Further, there is a tendency for some dealers to preorder cement, for which delays in delivery might be misinterpreted as indicating a serious shortage of supply. We have indications of extremely critical shortages of supply in specific areas but, on the whole, it seems to us that shortages of other building materials are more severe.

Competition by government agencies for cement is responsible in no little part for shortages of cement available to regular purchasers in specific areas. Projects of the U. S. Reclamation Bureau and the U. S. Engineers are taking large quantities of cement off the commercial market. The condition is also aggravated by demands for special cements other than type I standard cement.

Inability to achieve maximum production due to obstacles outside the control of the industry are a considerable factor. If these conditions would be corrected, along with plant rehabilitation rapidly being completed or undertaken by the industry, national productive capacity could be increased to compensate for most, if not all, the cement deficiencies.

Poor quality of materials, particularly coal, has had more of an adverse effect on production than the customer and layman realize. The cement industry is required to burn clinker with coal containing up to 20 per cent moisture, twice as much of the undesirables such as sulphur and ash, much reduced heat value and, incidentally, it is purchased at twice prewar prices. Machinery breakdowns have become much more frequent and severe as a result and the adverse effect of contaminants on continuous operations of kilns has multiplied. Fluctuations in clinker output resulting from kiln ring formation, which occurs much more frequently when burning low grade coal, have cut output very materially in many plants. It isn't uncommon for the penalty to be several hundreds of barrels of output per day in a single mill.

Methods to Increase Supply

Other articles in this issue detail progress by some of the cement manufacturers in their rehabilitation and expansion programs to increase pro-

ductive capacity. Some of the individual programs have involved expenditures of millions of dollars for equipment and plants, reflecting confidence in the future of the construction industry.

The more conservative manufacturers remember the overexpansion of the industry that followed the program of new plant building in the 1920's and are mindful of the fact that the last year or two are the first since World War I when real demand has equalled the industry's ability to produce. They are considering other factors as well before launching large-scale expansion programs. Among them are high cost of machinery in relation to prospects for earning profits, and the high depreciation rates that must be charged on the books, which compare with rates one-half as much for older mills with which any new plants must compete. Not so many years ago, the yardstick for plant building cost was $2.50 to $3.00 per bbl. of annual productive capacity; now manufacturers find the cost is around $6.00 exclusive of land and raw materials deposits.

Other considerations of recent date that have a bearing are the rising freight rates, which tend to shorten the shipping range particularly in times when demand exceeds supply, and the recent Supreme Court decision that the industry abandon its traditional basing point system of pricing. Should it prove necessary to ship cement f.o.b. mill plus total freight charges to destination, it is obvious that plans for plant expansion and building require thorough analysis.

The customer stands to be the loser, certainly under today's conditions of competition for cement, and very likely in times when supply again exceeds demand for cement. We know of ready-mixed concrete companies whose prices for bulk cement have already been increased to nearly $5 per bbl. on legitimate markets because of freight increases from more distant mills where no freight is being absorbed by the cement manufacturer.

The question facing the portland cement industry is whether or not it might prove more economical to build new plants closer to substantial market centers or improve and enlarge existing plants or whether storage and packing plants be established in those areas. It's all a matter of economics. Market potentials over the long pull are the major consideration and the most difficult to ascertain. With little likelihood of reduction in labor and other costs the industry is mindful of the fact that almost full capacity of operations must be assured in order to guarantee a profit.

With all these uncertainties, much investment continues to be made in existing manufacturing plants. Much of it is concentrated in bringing up deficiencies in capacities of mill departments in order to effect a balance for greater overall output. Emphasis continues on installations to conserve fuel including long rotary kilns, filters, heat exchangers, and in waste heat boiler plants, more efficient power generating equipment, etc.

Every mill department is coming in for consideration, and changes are being made or planned for greater output and for more efficiency. Correction of unbalanced capacities between departments in a given mill is instrumental to considerable increase in total capacity as pointed out in some of the comments received.

Where Supply Is Short

Comments on the supply situation generally and plans to improve output, were typically as follows:

A manufacturer with plants in various parts of the country said, in part: "Generally speaking, the supply of cement available throughout the country was adequate for the work undertaken during the year. There is no doubt but what some local shortages developed, but in most cases those shortages were of short duration and eventually the supply caught up with the demand. There are, however, several exceptions to that general statement, and these were in the southern portion of the country which included Florida, Southern Louisiana, portions of Texas, and Southern California. Even in these areas cement, while difficult to obtain, was available in fairly reasonable quantities but at prices higher than those at which cement was being offered by local mills. In other words, cement was moved in from out-of-area points, with consequent increases in price brought about by higher freight rates.

"We question how much actual work was deferred because of the lack of cement. On the other hand, we know of considerable work which was deferred, but the reason given therefore was extremely high construction cost rather than lack of cement. It must be borne in mind, too, that the extremely active demand for portland cement is caused to no small degree by the construction of large projects sponsored by the U. S. Engineers, the Bureau of Reclamation, and other governmental agencies. In addition to the heavy demand created by these projects, the situation is further aggravated by those projects calling for types of cement other than the standard Type I. A demand of this kind causes delays and to some extent cuts down production.

"In addition, consideration must be given to the winter months, which create a problem for the northern mills — the problem being adequate storage space in order to store cement for the heavier demand which usually occurs during the summer months. At most mills storage is an acute problem and therefore, in order to keep mills in full operation and prevent shut-downs brought about by full warehouses, consideration must be given to the export field which, during the year 1947, took approximately 8,500,000 bbl. of cement, much of which was shipped because the local demand could not absorb it.

"The same conditions which prevailed during 1947 are likely to recur during 1948. Some additional production will undoubtedly be available. In the aggregate, barring possible strikes within the industry and supporting industries, particularly in the coal industry, there is likely to be 10 per cent more cement available than there was last year. Even this, however, will not prevent local shortages where an inordinate demand exists and where local production is not capable of coping with it.

"In our opinion, too, the situation is likely to be aggravated by the recent Supreme Court ruling which forbids freight absorption. This may result in some areas which last year obtained cement at reasonable prices failing to get adequate supplies, or if cement is available, then at considerably higher prices. We are still of the opinion, however, that so far as over-all production is concerned, there is adequate production to meet the demand of the construction industry."

An Eastern manufacturer replied: "We know of no ready-mixed concrete company in our sales area purchasing our product which found it necessary to shut down due to lack of cement. It has, however, been necessary to allocate our shipments some days in order to serve each user of our product fairly. Furthermore, it has been necessary for us to withdraw from the export market so as to supply the requirements of our regular line of customers, and we will in all probability continue to do this for the next year. Also, for the past three months it has been necessary for us to decline to accept business, not only from our old line customers but from new accounts seeking a supply of cement due probably to the fact that their regular suppliers could not take care of their present requirements.

"Our big problem is better production. One of our greatest difficulties has been poor quality coal (caused by Mr. Lewis and the vacation desires of the coal miners). In some cases the moisture content in a car of coal would be 20 per cent. Many of the materials purchased today are not of the quality of years gone by, which is another retarder of increase in production. We have just completed a new kiln installation which will increase the production of one plant by approximately a half-million barrels per year.

"It is my opinion that the demand for portland cement will continue for the next four or five years. A war may change this opinion, but it seems

to me that war may increase the demand for cement, caused by the necessity for better highways, larger airports, etc., in order to move military men and equipment."

A Pennsylvania manufacturer stated as follows: "While a shortage of cement has existed over the last couple of years, the industry is not unmindful of the many years prior to the war when the production was down below 50 per cent. In fact, up until two years ago, the industry had not operated at capacity since World War I. For this reason the industry as a whole is skeptical of building new plants or making large capital expenditures on old ones. Of course, there has been a mill or kiln added here and there but mostly for modernization or economy rather than increased production.

"Our company has in mind a new finish mill and a battery of silos which will give us 300,000 to 400,000 barrels additional production. However, equipment is still hard to get and just when we will go ahead is uncertain."

A New York manufacturer: "There is heavy demand for cement in this area, but we are taking care of our ready mixed concrete producers and believe that we will be able to satisfy their requirements. We have restricted our shipping to an area less distant than previously."

A midwestern manufacturer: "First of all, let us get the problem in its proper perspective. Remember, this is the first time in over 30 years that real demand has forged ahead of supply. The basic question, then, is whether this is a one-time situation that may last only a year or two or whether the relative demand for cement has moved up to a permanently higher level. This is a difficult question to answer but it is the primary question that a cement manufacturer must answer in considering capacity additions as a solution to the current problem.

"But even an answer to that question does not settle the matter. There must also be considered the earning potential of any capacity addition. It takes a lot more money than in the past to build a cement plant today and to provide the necessary working funds. Generally speaking, the earning return today, based upon capacity operation at the current price level, would not adequately support the investment that would have to be made.

"One hears of additions to capacity at existing plants here and there. Where this can be accomplished by the process of building up capacity deficiencies in some departments, thus producing an increase without building a complete new plant, the economics of the project may be favorable for the moment. But for the long pull, even this may not be desirable. When business is brisk, shipments can be readily made to distant markets. But when the picking is slim the buyer tends to buy from the near-by source. At such time, that 1,000,000 barrels of capacity which was added to an existing plant might be of much more value if it were represented by a separate plant located perhaps some 300 miles removed.

"Our company owns at least one raw material deposit where the future marketing potential is good but there is a grave question as to whether the project could be made to pay an adequate return on the investment required today. Add to this the certainty of numerous delays in bringing such a project to completion and you don't have an encouraging picture.

"But to return to the basic question. We here think that the relative level of consumption of portland cements will be higher in the future than in the past if some semblance of the current ratios between selling prices for cements and other building materials can be maintained. At the same time, we don't believe that this relative level will be as high in the future as the current situation would indicate. This conclusion seems to suggest that considerable discretion be exercised in providing additional capacity, even assuming that an adequate income return could be achieved. For one thing, it is necessary to distinguish well between the locales of ephemeral demand and those marketing areas where growth and development is likely to be a continuing process.

"There are a few strategic locations here and there in this country where additional plants could be built. Raw material deposits at many of these locations are already owned by existing manufacturers. The difficulty, however, as already stated, is that the probable net income return, even at full capacity operation, will not support the investment that would have to be made.

"Generally speaking, cement today is priced on the basis of a depreciation charge against a remainder of about 50 per cent of original plant value. If one takes the trouble to analyze the current published reports of the cement companies, one finds that the average charge for depreciation runs less than 2¾ per cent of original plant value. Compare this with a probable 5½ per cent charge for a new plant starting out, and on a total value almost double the values of the older plants of competitors. If you do so you begin to get some idea of the handicap the new venture is under. The selling prices the new venture must establish would be governed largely by the depreciation costs of the older plants. These depreciation costs of the older plants might be as much as 70 to 75 per cent under those of the new plants.

"The foregoing reasoning seems to preclude the possibility of any great activity in new cement plant construction for the present at least. Nevertheless, in the light of our observations on consumption trends, there doesn't seem to be much necessity for large-scale additions to existing capacity. There are specific spots, of course, where shortages at present may be acute but, in general, and for the long-pull, the current shortage situation seems to us to be of minor importance for the present and of little significance for the future.

"The conclusions to be drawn from the foregoing discussion, briefly stated, are as follows:

"1. Cement shortages should not last more than one or two years.

"2. Actual deficiency in supplying demand should be relatively small in these years.

"3. There will be some increases in cement producing capacity during the next few years, generally at existing producing plants.

"4. Current capacity plus the additions mentioned in item 3 above should be sufficient to take care of any foreseeable increase in the level of relative demand."

Shipments Up 30 Per Cent

A large manufacturer with many plants: "During the first five months of this year, this company's shipments of all products were 30 per cent more than those during the corresponding months of 1947. At the end of the five months' period, however, our stocks at plants were nearly a third less than they were a year ago. Our current production rate is 20 per cent more than a year ago. Figures from the U. S. Bureau of Mines indicate that the entire industry is manufacturing and shipping at a rate higher than a year ago, and we expect the industry shipments this year to reach a total of 200,000,000 barrels for an all-time peak. This would be 13,000,000 barrels more than the 187,000,000 barrels shipped in 1947 which was the largest in history."

A manufacturer in Ohio: "This company is carrying forward as rapidly as possible its plans for increased capacity which were formulated during the war and for which equipment was purchased as soon after the war as possible. Our program centered around the installation of a third kiln thus increasing our theoretical capacity by 50 per cent. This kiln was fired for the first time Monday, June 14, and will soon be up to production barring unforseen circumstances. We will, therefore, produce for the remainder of 1948, 50 per cent or more clinker than was produced in the same period in preceding years. On an annual basis, we will not realize the full potential of this added kiln capacity until about 1950 when our program should be completed. We do not know of any way by which we might have obtained the added capacity any sooner nor do we feel that our market

justifies consideration of additional capacity beyond that which is planned. It is our belief that the industry will produce more finished cement by about 10 per cent in 1948 than was produced in 1947."

A midwestern manufacturer: "I can only state that our plants are this year producing more cement than they have ever produced. At the present rate, our year-end output will exceed any previous output by at least ten per cent.

"We have, since the war, successfully installed new and modern equipment in our plants, which should enable us to continue this present rate of production. We are concerned, as well as many other people, with the fact that the present demand exceeds the capacities of the mills to produce adequate quantities of cement. We will continue to do everything within our abilities to improve and increase our productive capacity so long as this demand exists."

Another Pennsylvania manufacturer: "Our cement plant was built in 1920 with three kilns, two of which were modernized in the early 30's and the other kiln is now being modernized. This program resulted in previous years in increasing production per kiln about 50 percent. Some minor changes have recently been made and others are under way, which will increase efficiency and increase our productive capacity to some extent."

Car Supply A Factor

A Lehigh Valley manufacturer: "I know of no cement shortage in the territory served by us, which is the normal shipping range of the Lehigh Valley district. At least, we are looking for business. Come the next few months, however, it may be that the car supply will prove inadequate, particularly if the eastern railroads will again be instructed to divert a certain percentage of their equipment to the western roads for grain movement. In that event, cement may be in short supply at some dealers' yards and ready mix plants."

Another Lehigh Valley manufacturer: "If an acute shortage of portland cement should develop during 1948, it will be largely due to the activities of Mr. John L. Lewis and his United Mine Workers. Nearly all cement manufacturers using coal have had to resort to inferior grades of fuel in their process, with resultant lower rates of production from their kilns. Machinery breakdowns and emergency shutdowns for repair have been caused by low grade contaminated coal.

"One of our first duties in this circumstance is to impress the users of portland cement and the general public with the vital necessity of maintaining adequate supplies of fuel for industry, and the far-reaching dire results of any prolonged interruption to the flow of that commodity.

"Our company is working diligently on new installations for increasing our output. Nearly everybody else is doing likewise in one way or another, either installing new machines or stepping up their efficiency. The Federal Government should take drastic steps to prevent any minority group from paralyzing the nation-wide effort to meet demands for housing, construction, and durable goods.

"Higher freight rates and the recent decision of the Supreme Court curtailing competitive freight absorption will create local shortages of portland cement in some areas."

A California manufacturer: "You ask what steps this company is taking to overcome any shortage of portland cement. First let me remind you that our shipments are limited by freight rates to Southern California, western Arizona and the southern tip of Nevada. There has not been an acute shortage of portland cement in this area. It is true that shipments have not been made the day orders were placed; that there have been delays of ten days to two weeks in making shipment; and it follows, of course, that dealers and contractors are now preordering (as they did not do in the past) so that we have a stack of preorders which might possibly be misinterpreted. But I repeat that there has been no shortage of cement in this area at all comparable with the shortage of other building materials. In the housing field, hundreds of thousands of foundations have been poured for houses and these stand idle awaiting lumber, wiring, heating, plaster, etc., etc. I believe the local housing authority determined this fact some months ago.

"It is our belief that the demand for cement has not reached its peak. Two years ago we commenced complete modernization and enlargement of one of our plants. At that time the plant had a capacity of about 1,000,000 barrels per year. A portion of the construction work was completed at the beginning of this year and the plant capacity stepped up to a little over a 2,000,000 barrel rate. In another 60 days the installation of additional equipment will increase the capacity of this plant to approximately 3,400,000 barrels annually. This increase of 2,400,000 barrels of output represents approximately a 20 percent increase in the 1947 capacity of all Southern California plants combined. It is my understanding that other companies in this area have increased the capacity of their plants but not to the same extent. It is my further opinion that in the last quarter of 1948 and in 1949 the necessity for pre-ordering cement will no longer exist."

A mid-western producer: "The shortage of cement in the United States is more marked in some areas than in others. Recurrent 'percentage-wise' increases in cement freight rates *have compounded* the freight disadvantages normally absorbed by the more distant competing mills, thus making unavailable at many markets much cement production formerly moving freely thereto.

"The scarcity of skilled labor; abnormal delays in procuring and installing repair parts; and interruptions of fuel supplies have impaired cement production at many plants.

"High costs and extreme shortages of lumber, and the substitution of concrete for other types of construction, have created abnormal demands for portland cement while relative production has lagged.

"Excessive costs and great delays in building new, or expanding old, cement producing plants tend to prohibit such investment ventures. It is estimated the cost of a new portland cement plant under existing conditions would approximate $6 per barrel of annual capacity—sans site and working capital—while the delays and headaches incident thereto would make their accomplishment physically difficult and economically hazardous.

"In spite of adverse building and expansion conditions above described, aggregate production capacity of cement mills in the United States and Canada has increased, and is now at its highest. It is conceivable the advent of our long-overdue recession will find portland cement capacity in the United States generally quite adequate to all needs, albeit the impact of the instant accelerated, and quite abnormal, peak demands cannot be immediately satisfied.

"This company is doing its utmost, by the introduction of refinements and available improvements, to increase production."

Imported Cement

Generally, the portland cement industry does not believe much difficulty will be experienced in the near future from competition through importation of foreign cements. It is also generally agreed that import duties on foreign cements are totally inadequate to protect the domestic industry and that any reduction of duty rates through revision of reciprocal trade treaties would have little bearing because the rates that prevail now are so low as not to be a factor.

Comments on that subject from several of the letters received are as follows: "With respect to reciprocal trade treaties, I must first say that I am not familiar with the latest developments in that direction. I am inclined to feel, however, that relatively little foreign cement will be imported, except: (1) in coastal areas, and (2) that imports will be limited to those coastal areas where an actual shortage of cement exists. Accordingly, I am inclined to think that little or no foreign cement will be imported in the Southern California coastal area."

"We are opposed to the elimination of, or reduction in, present import duties on cements from foreign coun-

tries. Under *existing* postwar conditions in Canada and abroad, I doubt the existing temporary cement shortage in this country would be thereby relieved appreciably, if at all: and under *normal* world conditions, it would be difficult for cement producers in the United States, with their high costs of labor, materials, and supplies, to compete with foreign cements made with cheap labor, transported from abroad virtually as ballast, as in former years—thus throwing American labor out of employment."

"As for importations of portland cement, it should first be realized that Canada is making strenuous efforts to get cement from us and could not possibly alleviate any shortage in the United States. The Countries of Western Europe, including Belgium and Denmark, have more than they can do to supply the demand in their own market area. The present import duties on portland cement have little effect on shipments from abroad. It would not materially raise the tonnage of imports if the duty were entirely removed. Substantial premiums are being offered for shipments of cement to countries of South America, Africa, and the Orient, and still manufacturers in this country and in Western Europe are unable to meet the demand. How then, by eliminating a few cents of import duty, can we induce shipments to the United States to relieve temporary shortages?

"Our company has discontinued export commitments for 1948 in our effort to supply domestic customers."

"Your second question about import duties is very interesting. I believe that no change should be made in the existing duties as they are not too restrictive. Of course we have to be willing to buy foreign goods to help the war-torn countries recover; however it is questionable whether we should permit dollar short countries which operate under low wage scales to dump cement in the United States. As you know the industry is already extremely competitive and chaos would result."

"There is no doubt in my mind but that we will in the comparatively near future feel the impact of foreign competition. Those people over there will endeavor to build up dollar credits, and we undoubtedly will help them to do so. With low labor costs and the subsidies granted by their governments to carriers, foreign cement can be delivered along the Atlantic seaboard for probably less than the American manufacturers' cost of production. At least, that was the situation in the past, and no duties were high enough to offset this."

"With respect to your comments regarding reciprocal trade treaties, we are obliged to advise we have no direct competition with imported cement, but can realize that an open market with cheap labor in foreign countries would result in considerable competition near the seaboard, which would reflect on interior mills by forcing the mills near the seaboard to seek a larger share of their business from the interior.

Larger shovels and haulage units have helped to reduce quarry costs

"At the present time it is our understanding that foreign countries are using all the cement they can produce, and are actually importing from this country, so the threat of importation seems to be for the future rather than for the present."

"We have no opinions on the question of reciprocal trade treaties. It is true that imports have in the past had some effect on our situation since it follows that if our competitors on the eastern seaboard are troubled with imports, the pressure for shipments westward increases. Naturally, we do not feel that it is a good policy for the United States to permit cement to enter this country at figures below the cost of production here."

"At this time we are not bothered with importations of foreign cement into the continental United States. Some Belgian portland cement has recently been offered at a price higher than the domestic price and therefore no imports have resulted. Our tariff on imports of portland cement is inadequate and will permit the importations of portland cement from foreign countries whenever the world-demand and the need for U. S. Currency make such shipments desirable.

"As to reciprocal trade treaties, I would not say that I am familiar with the latest developments in that direction, but have been noting comments in the press and certain periodicals. We are, of course, right at the border of Canada. We have never attempted to market cement in Canada but, because of the shortage existing there, there is a good deal of cement being sold by dealers along the border to Canadian users. We do not know of any Canadian cement coming into this country. Of course, on a reciprocal agreement that might be changed, although in a growing country like Canada they should be able to consume all of their product."

"Reciprocal trade treaties are of course good but each individual industry must be considered separately. Cement has many times been imported to this country practically as ballast for the ships.

"During the late depression when our industry was at low ebb, cement was brought over and laid down in Florida ports on a 35 cents per barbel freight rate. We have to absorb 35 cents per barrel getting cement from our plant into a market area which is only six miles away.

"With present high costs and in a normal market we doubt that our industry here could compete with foreign producers, especially plants located on our seaboard.

"Under the present extraordinary conditions it would be a help to have some imported cement coming into this country but in normal times it would definitely be disastrous to the industry."

"With respect to your second question, namely: reciprocal trade treaties. The latest developments in this direction are not likely to affect the portland cement industry for some time to come. If attempts are made to eliminate duties and these attempts are successful, we will not be seriously affected. In the first place, the duty on portland cement is 8.55¢ per barrel, which is totally inadequate and amounts to virtually no protection. Therefore, any action taken by the Geneva Conference or any action taken with respect to reciprocal trade agreements will hardly affect the cement industry to any greater extent than does the present inadequate tariff."

"We have been giving some study to reciprocal trade treaties, which is as yet incompleted. I do not believe that they need a great deal of study. We have gone through the importation of cement into this country beginning back in 1926. We will have it again, but I think that is some five to seven years away. I understand that foreign cement is now being delivered in South American countries."

PERMANENTE Doubles Capacity

Airplane view of cement plant which nestles in a canyon near Los Altos, Calif. To the right, background, is electrical dust collecting system. Adjacent to the kilns is the building housing the raw and finish grinding equipment. At extreme left are thickeners, and to the right of kilns are slurry storage tanks

Permanente Cement Co., balances raw grinding with finish mill capacity, modernizes clinker cooler system, and increases packing facilities

It seems to be traditional within the cement industry, at one time or another, to find that there is an unbalance of production within a plant. By this, I mean that if the kilns are capable of producing 10,000 bbl. per day, the raw mills will produce only 9,000; or if the finish mills are capable of grinding 12,000 bbl., the kilns may produce only 10,000.

When cement sales are low and plants are unable to operate at full capacities, these conditions rarely receive a second thought—at least there is very little action taken to remedy the situation. When cement sales are high and when mills are being crowded to their utmost capacities, the question arises as to how best to strike a balance in all departments to obtain a maximum production without enlarging the entire plant. Permanente's San Jose, Calif., plant, as large and as modern as it is, was no exception.

When the construction of the plant was started in June of 1939, there was a race against time to meet delivery schedules for the construction of Shasta Dam beginning in May, 1940. Ordinarily, more than a year would have been required to build such a plant. Specifications called for a maximum of 11,000 bbl. per day and 290,000 bbl. per month but, after a record-breaking construction period of just six months, the first sack of cement was produced.

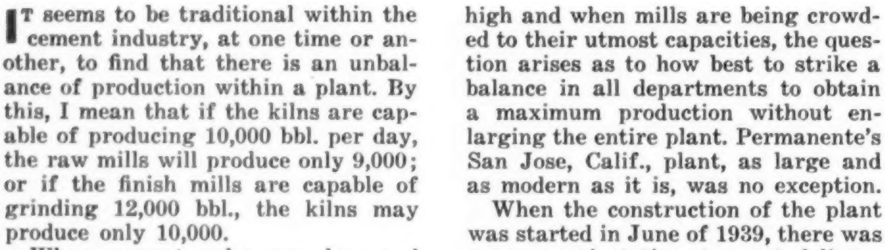
Increase Daily Capacity From 7000 to 15,000 bbl.

The original design of the plant was for two kilns, 12 ft. in diameter and 363 ft. long; two primary ball mills for grinding limestone, with rake classifiers; one primary ball mill for clay grinding; two 150-ft. diameter thickeners; two tube mills and three finish mills including a 9½ x 10-ft. preliminator mill with one 8 x 40-ft. finish mill and two 8 x 36-ft. finish mills for a capacity of 7000 bbl. per day.

By the middle of 1940, the U. S. Navy was preparing to use millions of barrels of cement for national defense in the Pacific Islands and it was apparent that numerous supply bases and air fields would be needed on the mainland. Add to this a market that was demanding all the production possible by the cement plants then in existence. Therefore, it was decided to expand facilities which involved installation of a third kiln, a 5-ft. Symons cone crusher, two secondary ball mills closed-circuited with bowl classifiers, and a double unit finish mill having a 9½- x 10-ft. ball mill ahead of an 8- x 40-ft. finish mill. Oliver All-American filters were also installed at this time to achieve more accurate control of the kiln feed by dewatering the slurry. This first expansion, which was completed in September, 1940, brought the capacity up to approximately 10,500 bbl. per day.

By 1941, the war situation had become more perilous; the United States government needed more and more cement, and it was obvious that the then existing facilities would be insufficient to supply the forthcoming demand. Thus, the second expansion program was inaugurated July, 1941.

In keeping with previous construction records, the fourth kiln was in



Raw grinding mills in circuit with rake classifiers

Two-kiln Diamond plant operated by Permanente near the heart of industrial Seattle, Wash.

Limestone is obtained by boat from a quarry in Alaska. Since acquiring the plant in March, 1947, production has been increased 50 percent

By ORVILLE JACK*

operation July 31, 1941, just one month after construction was started. Other units which were added included: a 10- x 125-ft. slurry thickener; a 9½- x 10-ft. primary mill, closed-circuited, with a bowl classifier; a Pennsylvania hammer mill for reduction of the clay and another finish mill having a 9½- x 10-ft. secondary ball mill ahead of a 8- x 40-ft. finish mill. This raised the capacity to 5,000,000 bbl. per year, or an average of 14,000 bbl. per day, giving Permanente the largest single cement plant in the world.

Following the war, it was expected by many that demand for cement would decrease. This, however, was not the case; on the contrary, demands have been even greater than before. The completion of mammoth Shasta Dam and the ending of the war has been followed by a postwar construction period unheard of in previous history. As a result, postwar production has been pushed to a maximum.

Rapid expansion, brought about by the war demands, caused an unbalance of production within individual departments. The grinding of large quantities of low heat clinker for Shasta Dam necessitated a large finish grinding capacity for this type of material —a much harder clinker to grind than ordinary Type I. Therefore, with the completion of this project, there was an excess of grinding capacity.

Because of the scarcity of materials and labor during the war, we were faced with a program of repairs and replacements. In surveying the needs of the plant, it was obvious that improvements and changes had been made in new equipment by which production could be increased and operations made more efficient. This survey also disclosed that the coolers on the kilns were in greater need of repair than any of the other equipment in the plant.

New Coolers Increase Production

After studying the situation, it was decided that by replacing the old coolers with new and modern equipment, an increase in production could be effected, with a corresponding increase in efficiency. This increase in production was calculated to be effective through a greater capacity for handling gases to the kiln and through an increase in the recovery of heat from the clinker in the cooling process. By the same token, an increase in efficiency could be effected depending somewhat, of course, upon taking advantage of the increase in production.

When the first cooler was put into operation in 1946, it demonstrated that these calculations were correct. A second installation, also in 1946, substantiated the findings of the first and it was not at all uncommon to see production records of 4200 and 4400 bbl. per kiln per day. The third and fourth installations were completed in 1947.

These coolers, reputed to be the largest of their kind ever built, are 7 ft. wide and 44 ft. long. They are of the inclined grate type and are fed with clinker from the kilns at 2500 deg. F. which is discharged from the coolers at a temperature of approximately 150 deg. F. Each has a capacity of 4500 bbl. per day. Fans supplying the cooling air have a capacity of 71,000 c.f.m., each at 10 in. of water static pressure, and have a speed of 1247 r.p.m. Each of the coolers has a vent stack approximately 10 ft. 6 in. in diameter by 50 ft. in height which serves to carry off excess air.

The heat recuperated from the clinker in the coolers is utilized in both the primary and secondary air for combustion. Primary air fans having a rated capacity of from 30,000 to 34,000 c.f.m. move heated air from the coolers at from 500 to 600 deg. F. to the burners. The remainder of the combustion air flows by natural draft from the coolers into the kiln through the clinker discharge ports as secondary air. The excess air from cooling the clinker then passes out the vent stacks at approximately 300 deg. F.

Approximate volumes of gases handled through the kilns in terms of 70 deg. F. are:

20,135 c.f.m. from water in the slurry.
5,015 c.f.m. of carbon dioxide from calcination of limestone.
3,125 c.f.m. from the natural gas used.
32,812 c.f.m. of combustion air.

Converting this total of 61,000 c.f.m. to 460 deg. F., which is the temperature of the gases when discharged from the kiln, the volume becomes approximately 107,000 c.f.m., not including any leakage air in the system.

With this large increase in the volume of gas handled, it was also necessary to make a change in the induction fans. This was accomplished by increasing their speed by 10 to 20 percent.

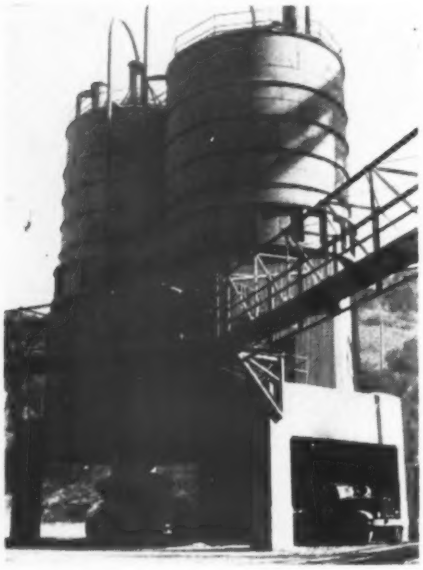
With improved burning conditions and with increased temperature of the primary and secondary air, the burning zone was shortened from approximately 60 ft. to 40 ft. This made it necessary to move the hot zone, which consists of a special periclase magnesia brick, closer to the nose of the kiln.

Step Up Raw Crushing and Grinding

Having increased the production of the kilns to approximately that of the

Installation of clinker coolers, one to each of four kilns, has helped to step up production 10 percent. Production at Los Altos plant is now 5,500,000 bbl. annually

*Chief Chemist, Permanente Cement Co.



Loading hopper pours 100 bbl. of cement into huge truck trains in less than ten minutes. More than 27 of these bulk delivery trucks are available

finish mills, it was necessary to find some means of getting more material through the raw mills. This was accomplished in three ways:

1. By crushing the limestone to a smaller size at the secondary crusher.
2. By utilizing surplus tube mill capacity for open circuit grinding of limestone. These mills previously were used only for clay grinding.
3. By feeding the raw limestone into the primary mill classifier, rather than directly into the ball mill itself. This classifies the limestone on the 14-mesh size, of which there is approximately 26 percent in the feed.

From the 5-cu. yd. Bucyrus-Erie shovel, that digs the limestone, and the 25-cu. yd., 16-wheeled Le Tourneau buggies, that transport the raw material to the 54- x 72-in. Buchannon jaw crusher, the material is conveyed over miles of 48-in. conveyor belting to feed Permanente's hungry mass of equipment.

A typical day's run of raw materials would be: 4350 tons limestone, 302 tons clay, and 92 tons gypsum.

The cement produced from these materials has a chemical analysis as follows:

SiO_2	24.48
Fe_2O_3	2.90
Al_2O_3	3.40
CaO	66.30
MgO	1.11
SO_3	1.30
Loss	.05
Na_2O	.28
K_2O	.17

All necessary raw materials for making cement can be found within the quarry site, with the exception of gypsum. Some special materials are purchased from outside sources for making special cements such as high early strength and pozzolan. Gypsum, purchased from the Standard Gypsum Company of California, is transported by ship to the Redwood City harbor from where it is trucked to the plant.

Other improvements recently completed include an additional reinforced concrete slurry storage tank of 13,000 bbl. capacity, and a large addition to the packhouse.

Permanente produces a dozen different types of cement which include standard Portland, modified Portland, high-early Portland, low-heat Portland, sulfate-resisting Portland, plastic, concrete pipe, three types of oil well cements, masonry cement, and a Portland pozzolan cement.

Increase Packing Facilities

The new addition to the packhouse makes it possible to sack four different types of cement simultaneously, as well as furnishing added facilities for bulk loading. The added facilities at the packhouse include a three-story, 50- x 100-ft. addition to the structure itself, the installation of a fifth four-tube packing machine, the revamping of the Fuller conveying and pumping system, the erection of a 5000 bbl. four-compartment steel storage bin adjoining the new packhouse addition, and the installation of new dust collectors. The new building furnishes added storage space for hydrated lime manufactured by The Permanente Metals Corporation and marketed by the Permanente Cement Company.

A converted Victory ship, the SS Permanente Silverbow, which is a self-unloading 10,000-ton capacity vessel, carries bulk cement to Honolulu, where it is discharged into silos and sacked for distribution to the Islands.

S. S. Permanente Silverbow which supplies Hawaii and other Pacific ports with cement from silos at Redwood City, Calif.

New Kiln Developments In South America

IN A PERSONAL INTERVIEW with John Henry Alexander, vice-president of the R. W. Ryder Engineering Co., Mountain View, Calif., one of our field editors obtained the following first-hand information relating to a new development in the cement industry in which the principle of the Lepol kiln for the first time has been applied to the wet process. Said Mr. Alexander:

"Our company built the first two Lepol kilns that went into the Davenport, Calif., plant of the Santa Cruz Portland Cement Co. This plant uses the dry process.

"As quite generally known, the Lepol kiln was invented by Dr. Otto Lellep and Polysius S. A. in Germany, and in the United States there are now three such kilns in operation and a fourth one in the construction stage. These kilns are producing cement with 4½ to 5 gal. of fuel oil per bbl. of cement as compared to 8 to 11 gal. for other types of dry process kilns.

Cut Fuel Cost

"The shortage and high price of fuel oil especially in South American countries has brought about the development of the application of the Lepol kiln into the wet process plants. This development has been accomplished with the collaboration of Dr. (Eng) J. J. Becker, superintendent of the Loma Negra Co. in Argentina, the inventors of the original Lepol kilns, and the staff of the R. W. Ryder Engineering Co. of California.

"I recently returned from a trip to South America where I obtained an order for a 2500-bbl. Lepol kiln with accessories. This kiln will be built in the United States. It will be built according to the new development in connection with the Lepol kiln and its application to wet process plants.

"The guaranteed fuel consumption of this installation is 5 to 5½ gal. of fuel oil per bbl. of cement, and this compares with 10 to 12 gal. per bbl. for most American wet cement plants.

"The plant in South America already has four medium length kilns in operation and this will be their fifth kiln."

Kiln Sets A Performance Record

Ponce Cement Corporation, Ponce, Puerto Rico, reports over a year's operation without stopping for repairs or delays due to ring formation

By CARLOS L. CINTRON*

UNDER normal conditions, it is not generally required that cement kilns be operated over a year without shutting down for repairs and maintenance, but with demand exceeding supply the industry has had to resort to practices which would not ordinarily be carried out. As many companies are faced with this problem, the experience of this company may be of interest. Here is the record.

Its No. 2 kiln was started October 15, 1946 at 10:30 a. m. and the feed was taken off on October 24, 1947 at 6:48 p. m. For this period of 374 days, the production was 612,005 bbls. of clinker, averaging a production of 1636 bbls. per day with a rated daily production of 1500 bbls. It is an F. L. Smidth Unax kiln, 9 ft. 2 in. x 8 ft. 2 in. x 9 ft. 2 in., in section, and it is 324 ft. 10½ in. long.

Kiln Lining

At discharge end there is a 15-ft. 7-in. long section of heat and wear resistant 6-in. fire brick. This is followed by a 70-ft. 5-in. section of 6-in. alumina fire brick, followed by a 42-ft. 7-in. section of 6-in. 40 percent alumina fire brick. Following these sections, is the insulated section which is 114 ft. long lined with 4½-in. fire brick placed on a 2½-in. asbestos slab Superex insulating lining. The remaining section at the feed end is provided with wear-resistant fire brick.

Synchronize Feed With Kiln Speed

The slurry kiln feeder is an F. L. Smidth automatic type. Feeding varies with the speed of the kiln. This is accomplished by means of a synchronized feeder drive consisting of an alternator coupled to the kiln motor and a special a.-c. motor for driving the kiln feeder. The alternator generates a.-c. current of a frequency corresponding to the speed of the kiln. This power drives the feeder motor, thus changing the speed of the feeder when the speed of the kiln is changed.

Lining life is affected by particle size of slurry, chemical composition, alkalies in slurry, variation of lime content, iron content, high heat, irregularity of speed, ring formation, direction of flame, length of burning zone, reducing flame.

It has been my experience that radiated heat is much more beneficial to good clinker burning than the direct flame on the clinker. The process of fusion is not so rapid, avoiding balling and clinker rings in the kiln. It is for this reason that I always try to get the longest possible flame so as to have a long burning zone. With a long burning zone and a long narrow flame the clinkering is done gradually by radiated heat and in a longer time than with a short and wide flame. With the long flame, the burners have more time to control the clinkering, avoiding the formation of balls and rings and the destruction of the coating and lining by overheating.

*Superintendent, Ponce Cement Corporation.

Strive For Long Flame

With a short wide flame the clinkering zone must be short and therefore the heat gets much higher and concentrated in a small space with the flame direct on it and on the clinker. This condition, naturally, overheats the coating and lining and impedes proper clinkering. This concentration of high heat is the cause of the fusion of the clinker, turning it into a magma which fuses the coating and the lining. This magma develops into balls and sometimes into a big one which you have to take out or your lining will be destroyed. At the same time that clinker is balling, at the back end of the clinkering zone a ring will surely be formed.

Controlling Ring Formation

Clinker rings not only reduce the fuel efficiency of kilns by acting as baffles radiating the heat of the flame back into a clinkering zone, preventing it from entering the calcining zone (Harold R. Gingerich, ROCK PRODUCTS, June, 1945) but reduce the life of the brick lining by raising the temperature in the clinkering zone much higher than necessary for the "incipient fusion" of the clinker, changing it into a big viscous magma. As a result of the high temperature, balls are formed which break the coating and wear the lining as they roll out of the kiln. It has been our practice to have the burner pipe as near to the outlet of the kiln as possible. As soon as a ring starts forming we push the burner pipe farther in and put the flame directly on the forming ring until it crumbles down, then the pipe is returned to its former position. This has always given very good results. Rings are very seldom formed with the slurry we are making, and they are easily burned down. Our burner pipe can be moved about five feet in the kiln.

High Kiln Velocity

During this period of a year and nine days I have been after the burners to keep the kiln running at full speed. I don't hesitate to recommend kiln velocities of 100 r.p.m. as an average. It has given us very satisfying results to keep it at high speed. At high velocity the slurry does not trip so fast in the chains, getting much higher into the flow of the hot air going through. This gives a high efficiency in the drying of the slurry and prepares it in a shorter time for the calcining zone. At the high speed the formation of big nodules is prevented in the calcining zone. No "puff" balls were formed while the kiln ran steadily at high speed. The clinker was of small uniform size.

At high kiln speed, the clinker is easily formed and the risk of ball formation is much less. The surface of the clinker exposed to the radiated heat is changing much faster, inducing a more uniform burning and not providing time to fuse completely to form any balls or magma.

Oil Pumps

Before this long run, we had trouble with the oil pumps and pressure. We had 350-lb. relief valves in the oil system. To have a pressure of 310 lbs. at the metallic hose in the burner pipe, we had to have the relief valves at the oil pumps jet at 350 lbs., therefore when the burner reduced the quantity of oil to the kiln the pressure went up at the pumps, sometimes up to 500 lbs. and this placed a heavy strain on the pumps. As a result, these pumps gave us much trouble, until we changed the relief valves to 600 lbs. Since then the pressure is very steady at 310 lbs. and the oil flows very uniformly, giving a very good flame.

Slurry

After long trials with our slurry of different analysis, it was found that slurry with the following analysis had

(Continued on page 131)

IDEAL'S Fifteen Million Dollar Pr

New plants at Portland, Colo., and Devil's Slide, Utah, materially increase capacity of Ideal Cement Co. to serve Rocky Mountain area

Overall view of new Portland plant. Kiln building is on left with thickeners in the foreground On extreme rig

THE GREATEST PROGRESS in postwar plant building and expansion in the entire Portland cement industry has been accomplished by Ideal Cement Co., Denver, Colo., which in the past two and one-half years inaugurated and largely completed a program of some fifteen million dollars that is increasing its annual productive capacity by 4,500,000 bbls. Ideal is now said to be the nation's fourth largest manufacturer of Portland cement, and has ten plants operating in the States of Colorado, Montana, Utah, Nebraska, Oklahoma, Arkansas, Texas and Alabama.

All the mills of the company had been hard pressed through the war period at the sacrifice of machinery and equipment, much of which was already obsolete and uneconomical of operation. Maintenance and equipment replacement of necessity had to be foregone for several years in the interests of more and more production for war, which left its mark on the efficiency to be expected later from most of the plants.

Construction view of new kiln building at Devil's Slide showing induced draft fans, breeching, stacks and location of the thickeners with respect to the slurry storage and kiln feed tanks

With prospects for a heavy volume of demand ahead in the postwar period, a program of replacement and modernization was planned in the fall of 1945 affecting several of the mills. The first major step was acquisition of the aluminum ore sintering plant at Mobile, Ala., from the Reconstruction Finance Corp., which was converted into a Portland cement plant (see August 1947 ROCK PRODUCTS, pp. 138) and from which a great deal of equipment including kilns became available for transfer to other plants at a time when new machinery was impossible to purchase. Original plans provided for transfer of sufficient excess kilns and other heavy equipment from Mobile to be the nucleus for new plants, one at Portland, Colo., and one at Devil's Slide, Utah, but demands upon the Mobile plant for export of cement, and of the southern mills of the company for equipment accounted for the Mobile reservoir of machinery.

Scope of the overall modernization and building program increased progressively as the demand for domestic cement grew, and great pressure has been brought to complete the plant building in order to meet demands for cement which have been extremely critical generally in areas served by the company. Major work involving long kilns and other improvements and enlargement have just been completed at Houston, Texas (see article in this issue) and at Okay, Arkansas; an entirely new plant has gone into production at Portland, Colo.; a second

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Program Steps Up Production 4,500,000 bbl

By BROR NORDBERG

right is 460-ft storage building with mill building paralleling it to left of conveyor bringing stone to quarry

new plant at Devil's Slide, Utah, will start operations later this year; and capacity of the Trident, Mont., mill is scheduled for a 30 percent increase in productive capacity. All the major plant building has for its principal objectives, aside from increased capacity in a few instances and improvement of product, economy of operation with emphasis on fuel, labor and power costs. All new kiln installations are in the 400-ft. range.

Demand for cement has been and continues extremely heavy in the Rocky Mountain area. The growth of industry and population in this area, and potential heavy drains upon capacity for U. S. Bureau of Reclamation construction projects, were considerations in the decision to rebuild the Portland, Colo., and Devil's Slide, Utah, mills, described herein. Originally it was planned to build new plants at both locations adjacent to the existing plants so that there would be no interruption in production during construction and the old plants could be dismantled later. Apparently capacity of both old and new plants will be required for the present and likely for several years ahead; and, should supply later exceed demand the old mills will be relegated to standby service. Productive capacity at Portland has been trebled and, at Devil's Slide, quadrupled. Cement users of the Rocky Mountain area will now have available 10,500 bbls. daily production in Colorado from plants at Portland, Colo., and Boettcher, Colo., and 6600 bbls. daily production in Utah.

Both new plants are of 4400 bbls. daily rated capacity and are wet process mills, whereas the old plants are of the dry process. They are basically identical in design and have almost identical equipment except for three principal differences. At Portland, natural gas is available for kiln operation whereas the Devil's Slide kilns are fired by direct-firing unit mills; Portland stone has slower settling characteristics so the thickeners exceed those at Devil's Slide in size for the same capacity; and harder grinding characteristics of the Devil's Slide stone necessitated longer raw grinding mills to accomplish the same output as at Portland. Other differences in the mills are only in a few details.

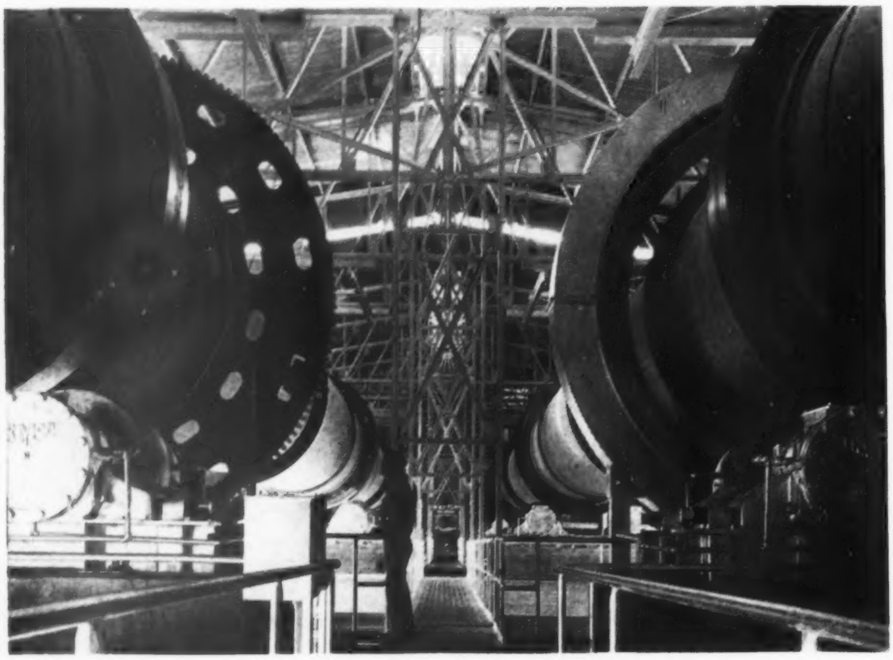
View of secondary end of crushing plant and 1500-ft. belt conveyor across Arkansas river, railroad and highway at Portland, Colo., plant

Production started at Portland in June so our discussion is largely of that mill and will mainly suffice for both.

General Features

Basic layout is a modified L as shown in the accompanying plan drawing. A long covered storage area for raw materials and clinker, with the raw grinding and finish grinding departments adjacent, comprises the short leg, and the kilns are perpendicular to the storage area. Thickeners fill the intermediate area so that the total area covered is practically a rectangle.

Manufacturing methods represent

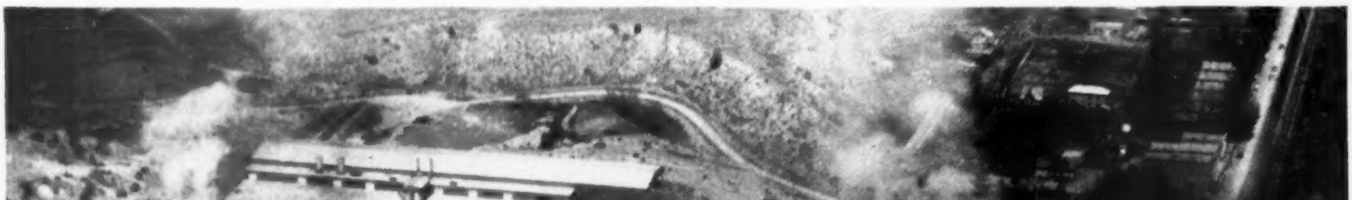

Two 10- 400-ft. rotary kilns, calculated to produce 4000 bbl. of clinker per day

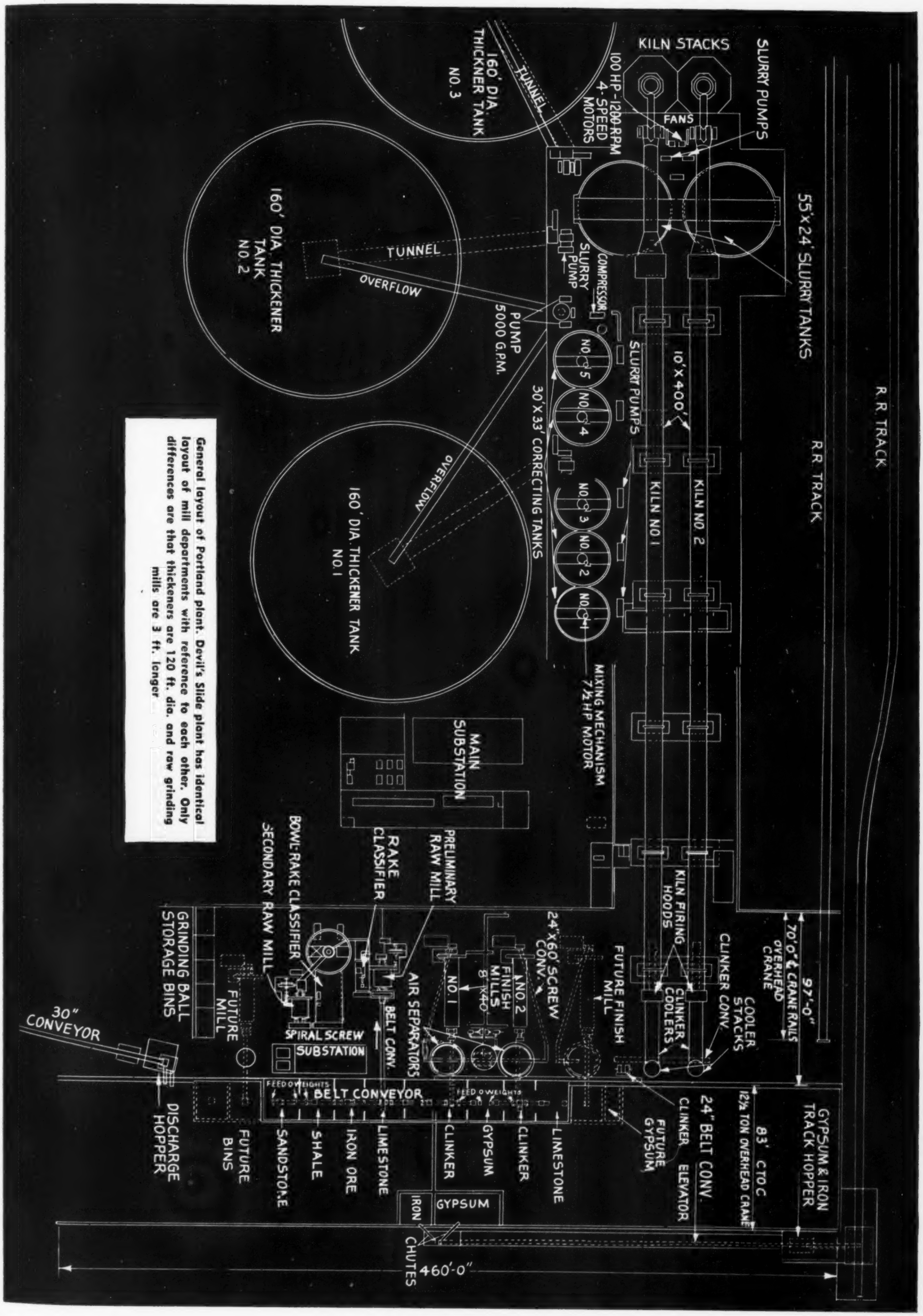
the very latest in modern practice, with two 10- x 400-ft. rotary kilns in each mill and provision for possible installation of a third unit. Similarly, space has been allotted for proportionate increase in grinding capacity. Wet process was adopted in order to attain uniform blending of raw materials, and great capacity and flexibility of operation was provided for in slurry storage and mixing tanks to accomplish that end. The mills have the flexibility to manufacture all the standard types of Portland cements.

Basic design of the mills provides for ready access to equipment for maintenance throughout, ease in materials handling and a spaciousness that will contribute to favorable and safe working conditions. Attention that has been given these details gives the impression that the design was planned to eliminate all the shortcomings and headaches that had accumulated in many years of operating experience.

All mill buildings are of concrete and steel construction, for firesafeness, permanence and good housekeeping. Some 600,000 sq. ft. of Mahon steel deck roofs and sidewalls comprise the mill structure (both mills) except for concrete retaining walls where side pressures must be withstood. This construction consists of an assembly of galvanized steel deck plates, with interlocking ribs that face out and are welded together in place. Standard plates are of 20-gauge steel, 12 in. wide, that when laid up, form a solid unit of ribbed steel welded to the supporting structure. Monovent ventilators extend over the roofs. Mercury vapor lighting simulates uniform daylight intensity throughout the plant.

Long screw conveyors for handling the output of clinker mills to mechanical air separators are provided so that elevating equipment and the air separators themselves may be located up close to the covered storage building in order that an overhead crane has free travel over the front ends of the kilns and the entire raw and finish grinding sections. This crane, a Northern Engineering Co. 10-ton machine, travels on a 70-ft. span and has a 40-ft. lift. It handles grinding media, conveniently stored in bins at the far end of the mill building, and may be used to handle trunnion bearing caps and perform general utility service at

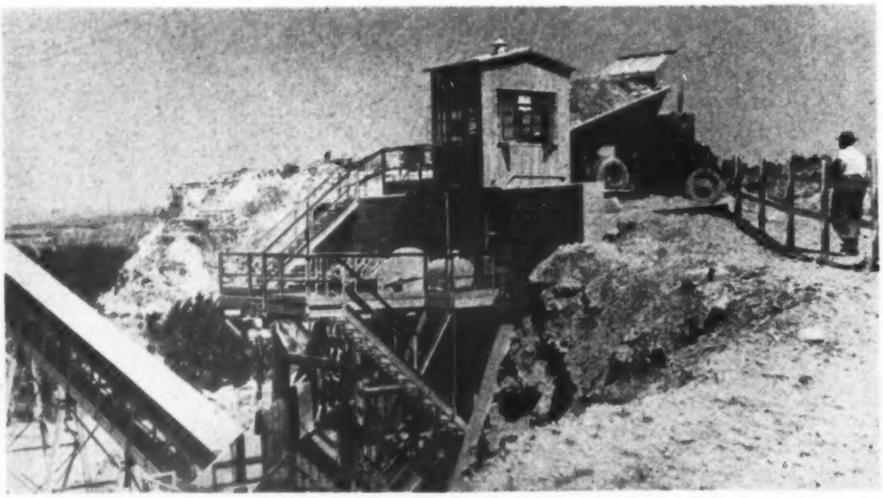

Aerial view of Portland plant showing relative locations of old and new p lants. Note long conveyor on right spanning highway and Arkansas river from quarry



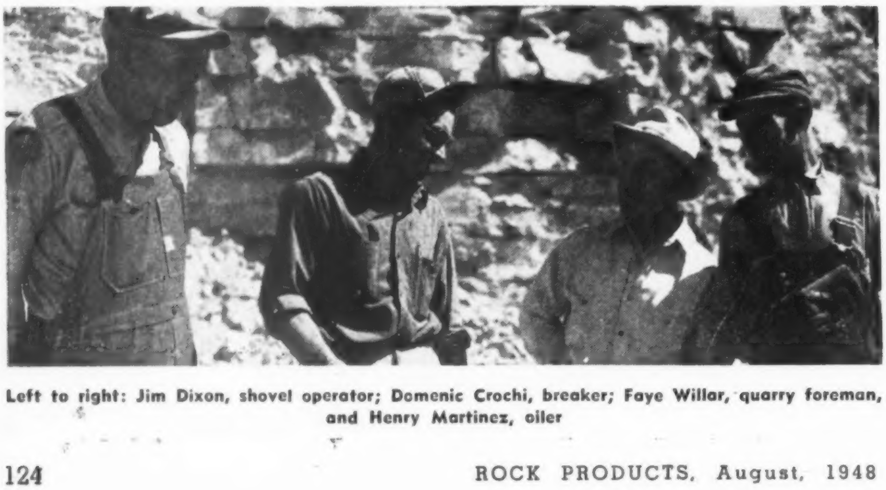
General layout of Portland plant. Devil's Slide plant has identical layout of mill departments with reference to each other. Only differences are that thickeners are 120 ft. dia. and raw grinding mills are 3 ft. longer

Left to right: Guy H. Friday, plant engineer; G. A. Gretencort, plant manager; and John Baker, assistant superintendent

A 4-cu. yd. shovel loading truck



Dumping a load of stone into hopper above primary crusher



Left to right: Jim Dixon, shovel operator; Domenic Crochi, breaker; Faye Willar, quarry foreman, and Henry Martinez, oiler

the kiln hoods and throughout the grinding section.

There are only four bucket elevators in the entire plant, one of which is for standby service. No equipment extends below floor level except the tail pulleys of these elevators and they are completely accessible for repair and service. Each elevator pit has an automatic sump pump and drainage sumps with pumps are provided in the raw mill. Standby slurry pumps and other equipment are provided wherever failure would interrupt the continuity of plant operations. Electrical switches and equipment are housed in convenient substations which are pressurized and thereby kept dust-free, and emergency electrical locking switches are located at key operations so that the safety of maintenance men cannot possibly be jeopardized through someone throwing a switch in one of the substations. There are other features of special interest having to do with production, such as the use of diaphragm pumps to feed kilns, that are discussed in our consideration of cement manufacture.

Portland Plant

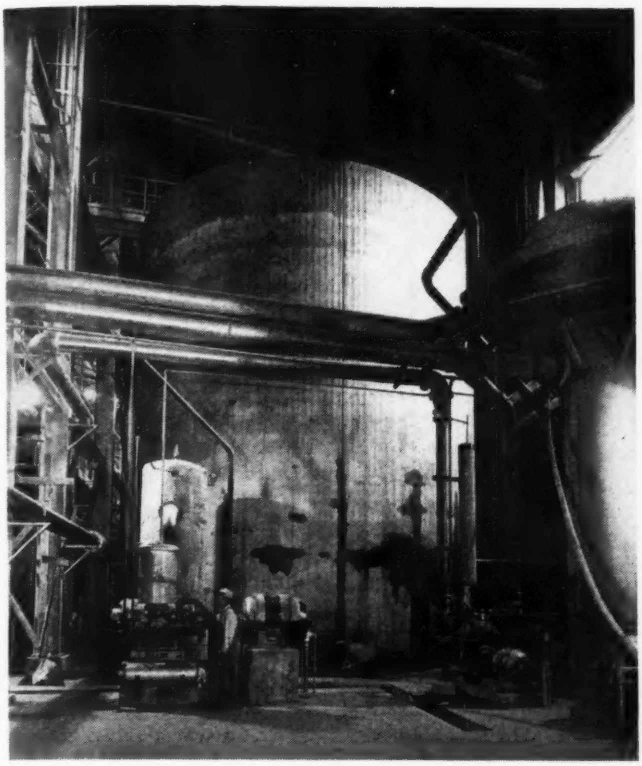
The Portland plant is in Fremont county on the Arkansas river some 20 miles distant from the world-famous Royal Gorge. Originally, the existing dry process plant was started in 1899 and its present daily capacity is 2600 bbls. of Portland cement. Silos built in 1923 accommodate the production of cement from the new as well as the old mill at Portland, otherwise the recently-completed mill adjacent is completely new. An entirely new crushing plant was completed prior to building the cement mill.

Quarry

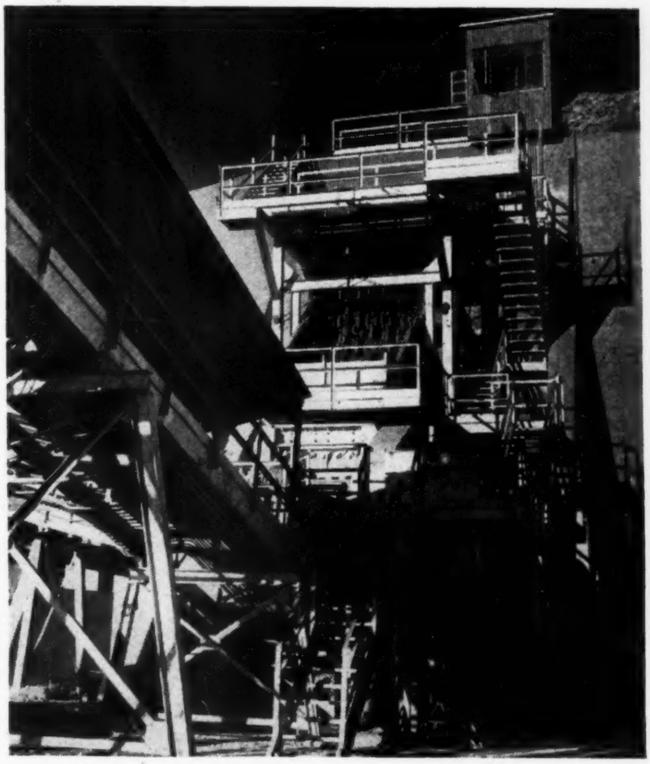
The quarry is on the opposite side of the Arkansas river from the mill, about one mile distant. Until the new crushing plant was built at the quarry, stone was transported to the mill in side dump cars driven by electric motors which travelled a trestle spanning the river, the Rio Grande main line and a through highway. Until a year ago, excavation was done by steam shovels that had seen some 35 years of service in the quarry.

Electric shovels have displaced the old steam shovels and rubber-tired haulage equipment now delivers stone to a crushing and screening plant, from which a long belt conveyor delivers minus ¾-in. stone across the old trestle into the storage area at the mill.

The stone at Portland occurs in a thinly-laminated formation which breaks down into slabby pieces. It is quarried selectively at two levels, on 60-ft. and 55-ft. benches respectively, and stone from the two levels is handled as two separate raw materials and proportioned as such for raw grinding at the cement mill. Low lime



Showing one of five slurry mixing tanks arranged in a row, paralleling the kilns. In left foreground is air compressor for slurry agitation; on right is distributor which receives ground slurry from grinding department and proportions it to the three thickeners



Close-up of primary roll crusher with chain feeder above. Truck dumping hopper is above at quarry level. Conveyor in foreground carries stone to secondary crusher

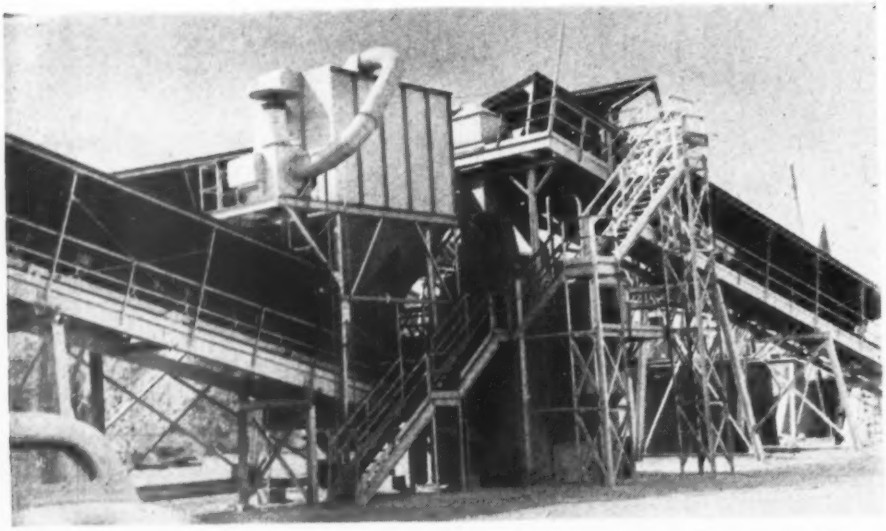
rock from the upper level averages 57 to 60 percent $CaCO_3$; high lime rock has an analysis of 80 to 82 percent $CaCO_3$. Both contain alumina in sufficient proportions to meet raw mix requirements. Incidentally, sandstone is available within the same quarry for cement manufacture and is quarried for the purpose.

Drilling is done by 6-in. churn drills and the fragmentation is such that very little secondary blasting is required. Excavating equipment comprises a 4-cu. yd. 1400 P & H electric shovel on low lime rock and a 3-cu. yd. 492 Marion electric shovel on high lime rock. Both are caterpillar-mounted and have Ward-Leonard control. Three 15-ton Euclid end-dump trucks powered by 150-hp. Cummins Diesel engines haul to the crushing plant, and a Diesel-powered Traxcavator trims the stone at the face and maintains the roadway.

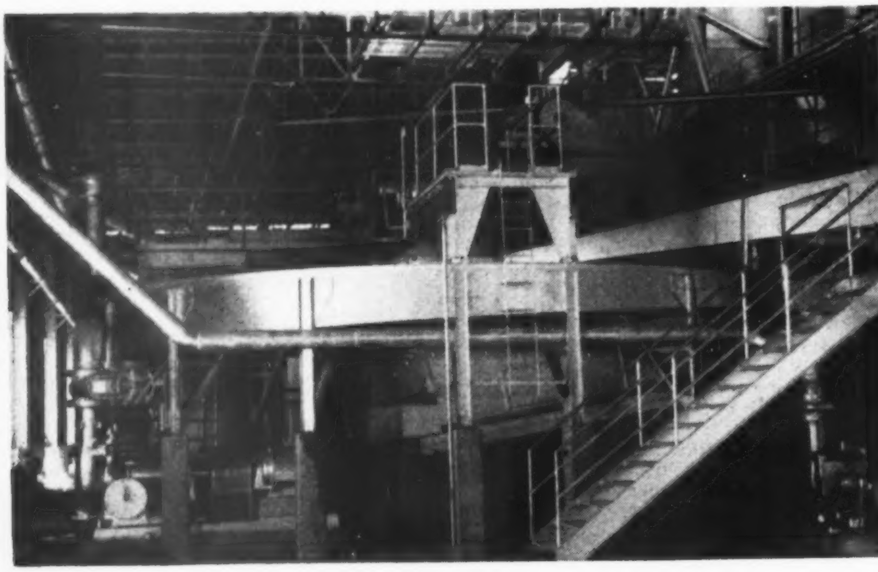
Crushing plant capacity of minus ¾-in. product is 300 t.p.h. which is sufficient, in five 8-hr. days, to meet requirements of both the old and new cement mills. Quarry-run stone is paid out from the truck discharge hopper to a 36- x 60-in. Pennsylvania roll crusher by a No. 10 Ross chain feeder. Output of the primary breaker is fed, over a 36-in. 6-ply conveyor belt, 97-ft. centers, into a No. 15-50 Pennsylvania impactor set for a reduction to minus 1-in. size. A 36-in. belt conveyor transfers the stone to a 6- x 12-ft. Allis-Chalmers 2-deck vibrating screen and plus ¾-in. product is circulated by a 24-in. belt transferring to the primary conveyor feeding the secondary breaker. The screen carries 1- x 6-in. and ¾- x 5-in. slotted woven wire cloth on the top and bottom decks, respectively, the top deck serving only to increase the screening efficiency through the lower deck. A circulating load of some 8 percent is carried at average capacity. Throughs are carried over a 30-in. 6-ply conveyor belt, 1530-ft. centers, to storage at the cement mills.

A roll crusher is preferred as a primary breaker because the stone is slabby whereas, at the Devil's Slide plant, where the stone is massive and tougher to crush, a gyratory is preferred. A 200-hp. electric motor drives the roll through V-belt; a 400-hp. direct-connected motor with Falk coupling drives the impactor at 720 r.p.m.; a 10-hp. motor drives the feeder; and a 50-hp. motor drives the long delivery belt conveyor at 300 f.p.m. All belting throughout the crushing plant and new cement mill is Hewitt rubber and belt conveyors are of Jef-

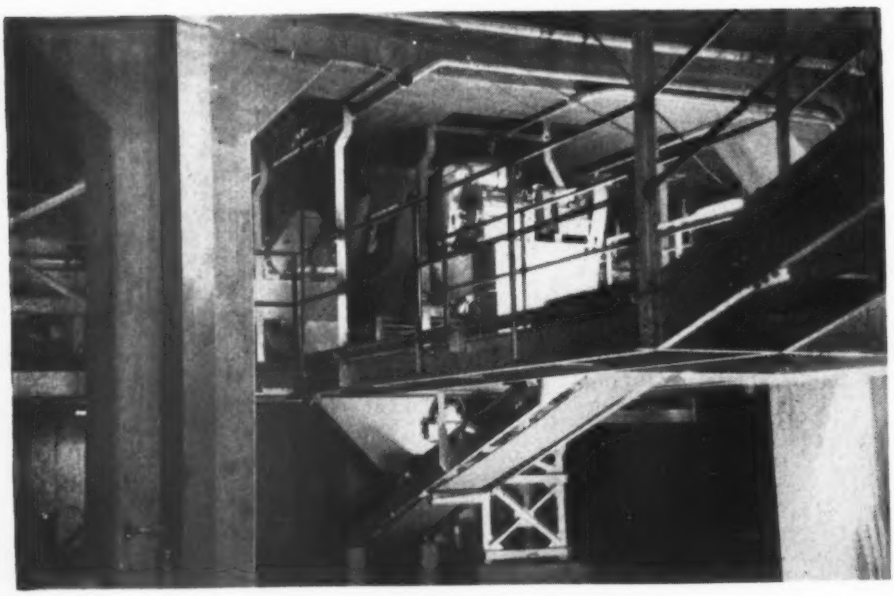
Looking down in quarry at 3-cu. yd. shovel loading haulage unit



Secondary crushing unit in center. Conveyor on right from primary crusher; on left to screen. Note dust collector



Bowl-rake classifier in closed circuit with secondary raw mill



Feedoweights for proportioning mill feed

frey make, with Stephens-Adamson impact idlers on the conveyor delivering stone into the secondary crusher. That conveyor is equipped with a Dings variable intensity iron detector which automatically stops the belt when large pieces of metal are encountered, and has a 36- x 36-in. Dings magnetic head pulley for removal of iron. A No. 200 Norblo bag-type dust collector and a No. 240 collect dust generated in the vicinity of the impactor and screens, respectively, and the dust is deposited on the long delivery belt.

The way the production schedule is set up, high-lime rock and then low-lime rock will be produced in alternate weeks, and a single crew will handle quarrying and the operation of the crushing plant.

Raw Material Storage

Stone from the crushing plant may be transferred, at the discharge end of the 1530-ft. centers main conveyor, to a second conveyor which discharges into the new storage area or be diverted to a 354-ft. centers 30-in. conveyor delivering to raw materials storage serving the old cement plant.

Covered storage for materials that comprise raw mill feed and finish mill feed is under a single roof in a building measuring 460 ft. in length, 78 ft. wide and with concrete side walls 24 ft. high. The building comprises the short leg of our L plant layout. A retaining wall separates the building into two areas, one 220-ft x 78-ft. for principal storage of raw materials and the other 240 ft. long for clinker storage. Capacities are 21,000 tons of raw materials and 110,000 bbls. of clinker. The raw grinding department adjoins the raw materials storage section of the covered storage area and receives raw materials proportioned from separate feed bins located in a row along the retaining wall inside the storage area. Similarly, the finish mill is alongside the 240-ft. wall at the other end of the storage building.

Materials in storage are re-handled and/or loaded into the several feed bins by a 12½-ton P & H electric overhead travelling crane with 4-cu. yd. Blaw-Knox bucket which travels the entire length of the storage building on rails spaced 80 ft. apart.

All the feed bins are flat-bottom concrete units, of varying capacity according to need. On the raw side of the storage area there are separate mill feed bins for high-lime stone, low-lime stone, iron ore and sandstone; on the finish end there are two clinker feed bins, one for gypsum and a fourth for limestone required for masonry cement manufacture.

Gypsum rock and iron ore are received by rail or track and separately passed through a crusher at the far end of the materials storage building. From a 15- x 20-ft. receiving hopper, a 42-in. x 32-ft. Link-Belt apron feed-

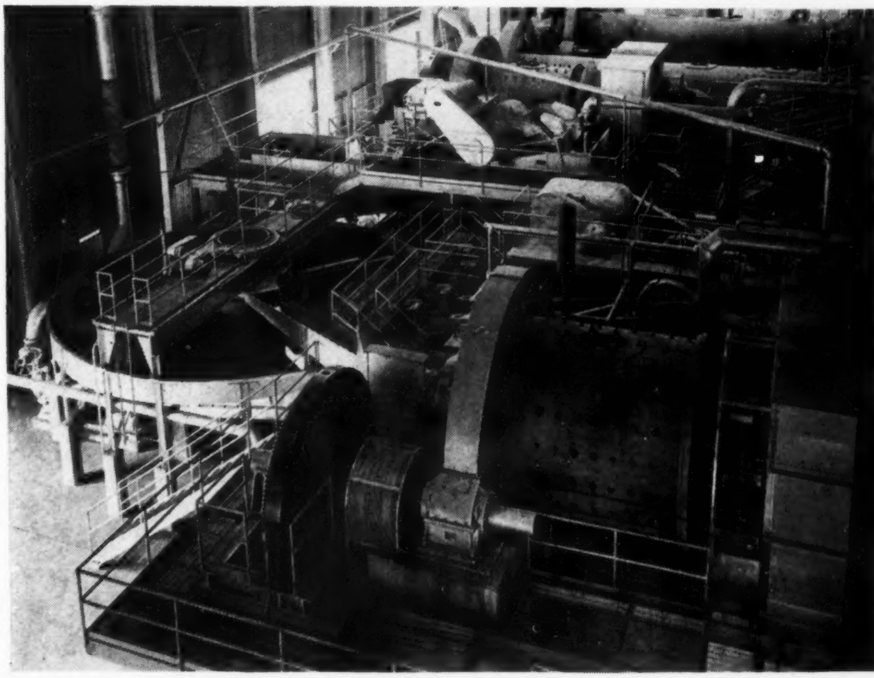
er pitched at 18 deg. regulates flow through a 24- x 50-in. Pennsylvania Armorweld single-roll crusher, powered by a 60-hp. motor. With a top size of about one inch, the gypsum, or iron ore, is conveyed over a 24-in. belt conveyor, 225-ft. centers, to a tipple just outside the storage area wall at the approximate mid-point. Thus, iron ore is chuted into a 700-ton storage just inside the main storage area on one side of the transverse wall, and gypsum rock into an 860-ton bin on the clinker storage side, for ready transfer by the overhead crane into the mill feed bins.

Raw Mill

Raw materials are proportioned and ground at the rate of 235 bbls. per hr. to a fineness of 90-91 percent minus 200-mesh by two stages of closed-circuit wet grinding. Proportioning is done by five 24-in. x 13-ft. Merrick recording Feedoweights, two for high-lime rock and one each for low-lime (shale) rock, sandstone and iron ore. These devices are each driven by a 2-hp. motor, have variable speed control, and are said to be accurate within one percent. The two on high-lime rock pay out stone directly to an 18-in. inclined belt conveyor 60-ft. centers, which discharges into a 12-ft. diameter drum and double scoop feeder on the trunnion of the preliminary ball mill; the others proportion materials on a common belt underneath which transfers on to the inclined mill feeder belt.

Both mills are 9 ft. 6 in. in diameter by 10 ft. 2 in., Traylor manufacture, and are driven at 18 r.p.m. by 500-hp. synchronous motors direct-connected by a pin and belt flexible coupling to the pinion shaft. The preliminary mill is closed circuited with a Dorr 8-ft. x 31-ft. 6-in. rake classifier (15-hp. Reeves variable speed drive). Water is introduced through the launder returning sands into the mill from the classifier and thus enters the mill via the scoop feeder. The grinding charge totals 41 tons of forged steel grinding balls consisting of 41,000 lb. (50 percent) of 3-in., 25,000 lb. (30.49 percent) of 2½-in., and 16,000 lb. (19.51 percent) of 2-in. balls.

Discharge is through 1¼-in. grate openings into a weir box from which a launder carries the flow into the settling basin of the rake classifier. The circuit is designed for a separation at 48-mesh and a circulating load of some 250 percent. Settled sands are raked into the launder for return into the mill; the overflow is laundered into a Dorrco 16- x 42- x 27-ft. bowl-rake classifier in closed circuit with the secondary ball mill. The rakes and bowl have Reeves variable speed drives and are powered by 20-hp. and 7½-hp. motors respectively. Circulating load of this secondary circuit will approximate 200 percent, overflow (90-91 percent through 200-mesh) comprising feed to the thickeners.

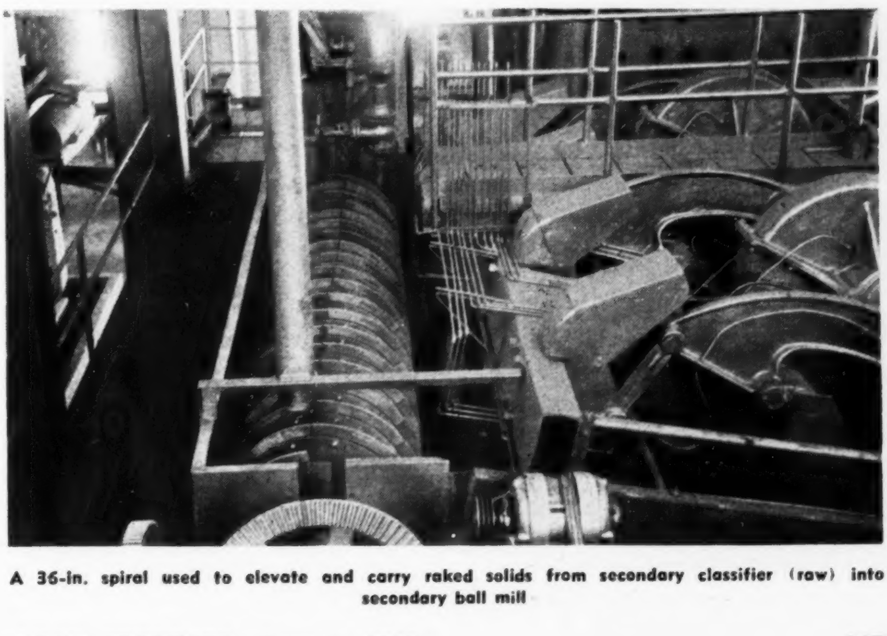


Raw grinding department is in foreground; clinker grinding department in background. In front is secondary ball mill (raw) close-circuited with bowl-rake classifier. Back of bowl is preliminary mill (raw) closed-circuited with rake classifier. In back are two compartment mills

Sands settled in the bowl are raked into a transverse 36-in. diameter spiral screw which functions as a conveyor to discharge into the scoop feeder of the secondary mill. The screw is 17 ft. 4 in. in length and is driven at 15 r.p.m. by a 7½-hp. motor. The mill has ¾-in. discharge grates and carries a load of 43,000 lb. of 2-in. forged steel grinding balls, 26,000 lb. of 1½-in.; and 17,000 lb. of 1¼-in. balls. An 8-in. Wilfley slurry pump direct-connected to a 40-hp. splash-proof motor pumps the overflow to a distributor tank serving three thickeners. A second pump functions as a standby.

Accurate mixing and blending were the objectives in the decision to build a wet process mill, and an extremely flexible arrangement of thickeners, mixing and correction tanks of adequate capacity for the various mixes of raw materials for all the basic types of Portland cements is one of the highlights of the plant. The system consists essentially of three 160-ft. diameter Dorr center pier torque thickeners of one and one-half million gal. capacity each, five 30- x 33-ft. circular correcting tanks of 2000 bbls. capacity each, and two 5000 bbls. covered slurry feed tanks that measure 55 ft. x 24 ft.

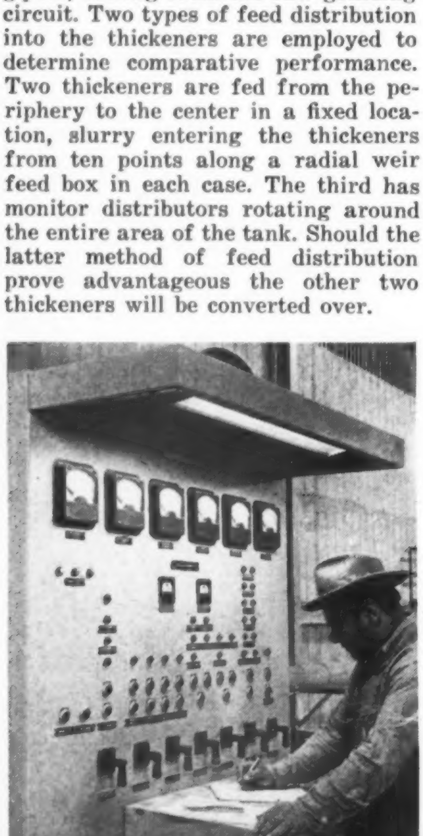
The thickeners have concrete side walls, with 10-ft. side depth, and are



A 36-in. spiral used to elevate and carry raked solids from secondary classifier (raw) into secondary ball mill

Overhead crane in operation in storage building 460 ft. long. Tipple from gypsum and iron ore may be seen in background, lower center. Stone from crusher enters by way of chute on left

fed equally from a distributing tank into which the overflow from the bowl classifier in the secondary grinding circuit is pumped. The split is accomplished by three equidistant radial weirs in the distributing tank. Volume of water circulating is 3000 g.p.m., coming from the raw grinding circuit. Two types of feed distribution into the thickeners are employed to determine comparative performance. Two thickeners are fed from the periphery to the center in a fixed location, slurry entering the thickeners from ten points along a radial weir feed box in each case. The third has monitor distributors rotating around the entire area of the tank. Should the latter method of feed distribution prove advantageous the other two thickeners will be converted over.



One of the electrical control panels

High-lime slurry has fast settling characteristics but the alumina and clay slimes in the low-lime fraction hinder the rate of settling. However, a normal mix settles to a good density in 48 hr. and operation of two thickeners is sufficient for capacity in manufacturing normal Portland cement.

Two 6-in. Dorr duplex diaphragm pumps deliver settled material from each thickener into a pump head box from which a 5-in. Wilfley pump delivers slurry into mixing tanks. A slurry consistency between 35 and 38 percent H_2O is anticipated for kiln feed, and generous pump heads and large discharge lines were provided wherever they would contribute to handling slurries of increased density.

Generous thickening capacity contributes to versatility of operation. With three thickening units, series thickening would be feasible if desired. Any two can be operative on one brand of cement while drawing out of a third or holding a tank, etc. A pump handling the output of a thickener can pump into any of the mixing tanks, to the kiln feed tanks, to another thickener or, to keep the lines open, back into the same thickener. Five-inch Wilfley pumps at each slurry feed tank are cross-connected between tanks so one functions as standby, in delivering slurry into ferris wheel feed tanks from which the kilns are fed. Overflow circulates from the ferris wheel feeders back into the kiln feed tanks. A Dorrco diaphragm pump is the reserve for feeding each kiln. These pumps have metering characteristics and have been used successfully for feeding kilns in one of the other plants of the company. They are driven by D.C. motors through rheostat control and, in addition to speed variations, the stroke is changeable. All slurry tanks and the feed tanks have Dorr mechanical and air agitation for continuous inter-mixing, the air supply being at 35 p.s.i. from a Fuller stationary air compressor.

Blending

Each of the five mixing tanks is served by an individual 8-in. Wilfley slurry pump, so connected that there is absolute flexibility as to where the slurry may be pumped, whether it be between tanks or into kiln feed tanks. For correction purposes, one tank usually will carry high-lime slurry and a second one, low-lime material, for diluting or sweetening a mix. These special slurries are ground in open circuit and require no thickening. Sampling is to be done continuously and with regularity at key points in the slurry flowsheet. A sample of the overflow product from the secondary grinding circuit is taken as a rough check on constituents of the raw material. Thickener discharges are sampled at the diaphragm draw-off pumps, the point from which slurry is pumped into the mixing tanks. Samplers are of Stearns-Roger manufacture. Slurry that is "off" in composition as determined from samples taken of the overflow product from grinding might be diverted to the high or low-lime mixing tanks. Adjustment upward or downward in richness of mix is accomplished by adding a certain percentage of the special slurries, as measured by depth, into the slurry in process.

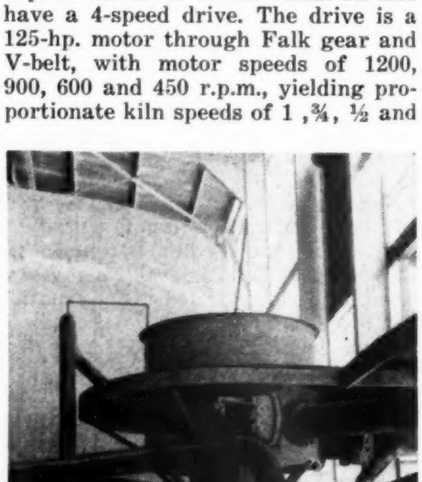
Depth of slurry in each of the mixing tanks is indicated and recorded by a Foxboro instrument, which is actuated by pressure of the slurry in a tank on a compressed air line within the tank which is the source for air bubbles within the tank. Similar instruments are to be installed on the kiln feed tanks.

Water Supply

Water for thickener operation comes from the raw mill grinding circuit, while new water to compensate for that lost through evaporation in the kilns is supplied from the power plant condensers in the power house of the adjoining old plant. Make-up water is added into the distributor ahead of the thickeners by either a 300 or a 600- g.p.m. Buffalo pump located in the power plant of the old cement plant. A 5000 g.p.m. double suction Buffalo pump, with a duplicate standby unit, returns the thickener overflow to the mill steady head tanks and any excess is pumped by means of a 1000 g.p.m. Buffalo pump to the 500,000-gal. storage tank on the hill.

Kilns

Each of two welded Traylor rotary kilns measures 10- x 398-ft., to which a 2-ft. nose ring is bolted. They are supported on six sets of rollers, are of 2-, 1-, and ⅞-in. steel plate, carry a pitch of ⅜-in. to the lineal ft. and have a 4-speed drive. The drive is a 125-hp. motor through Falk gear and V-belt, with motor speeds of 1200, 900, 600 and 450 r.p.m., yielding proportionate kiln speeds of 1 ,¾, ½ and



Distributor box which receives overflow from classifier and proportions equally by wiers into three thickeners

¼ r.p.m. Firing is by natural gas at 50-60 p.s.i. Rheostat-controlled motors driving the ferris wheel feeders, and the alternate diaphragm feed pumps, are operated from the firing floor.

Each kiln is lined differently to check comparative service performance, and neither is insulated. One carries 10 ft. of 40 percent alumina brick at the firing end, followed by 100 ft. of 70 percent alumina brick and 147 ft. 8 in. of 40 percent brick. The next 97 ft. 7 in. of length has a 4½-in. concrete liner, mixed one part Portland cement with three of ½-in. crushed firebrick, and the last 45 ft. 9 in. is unlined. Forty percent alumina brick line the second kiln throughout. Starting from the feed end, No. 1 kiln is unlined and at the 15-ft. point there is a straight suspended chain curtain, 8137 ft. 6 in. total length, extending a distance of 54 ft. 9 in. An additional 3820 ft. of chain may be hung later.

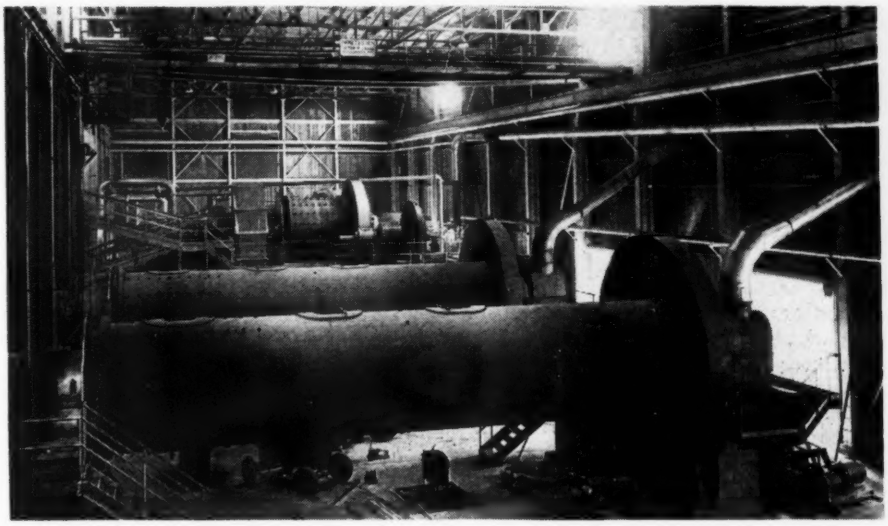
Firing is under induced draft supplied by individual American No. 21 double-inlet, induced draft fans driven by 100-hp. motors through V-belt at 1200, 900, 600 or 450 r.p.m. to conform with kiln speed. They are rated 100,000 c.f.m. at 600 deg. F., have louvre damper automatic controls and exhaust through individual 8- x 175-ft. unlined steel stacks. Back end temperatures between 400 and 600 deg. F. are expected to be realized, with a fuel consumption of approximately one million B.t.u. per bbl. of clinker produced.

Clinker discharges over a 6- x 33-ft. Fuller inclined grate cooler, on each kiln, rated at 2000 bbls. per day of clinker cooled down from 2500 deg. F. to 125 deg. F. These coolers have automatic bed level control, and Sturtevant blowers with a rated capacity of 47,000 c.f.m. at 7½-in. waterstatic pressure force air through the clinker bed where it is preheated and becomes secondary combustion air.

Finish Grinding

Clinker is ground into cement at the rate of 235 bbls. per hr. (total) by two identical closed circuits, each consisting of an 8- x 40-ft. Traylor 3-compartment tube mill in closed circuit with a 16-ft. Sturtevant mechanical air separator and carrying a 200 percent circulating load. The mills have ⅝-in. grate openings at discharge into the second compartment, ½ in. at discharge into the third compartment and ⅜-in. at the discharge end. They carry an 81-ton charge of forged steel grinding balls and are driven at 19 r.p.m. by 1000-hp. synchronous motors.

Grinding operations are set up for straight line flow of clinker from the kilns, to eliminate excess handling except from storage. Clinker as it comes from the coolers is carried by a manganese steel drag conveyor to a Link-Belt bucket elevator from which it is



Clinker mills just before going into production. Discharge (right end) conveyed by concealed screw conveyors to elevator (not shown) on left to air separators (not shown) to clear way for overhead crane which serves finish mills, feed ends of kilns and raw mill in background

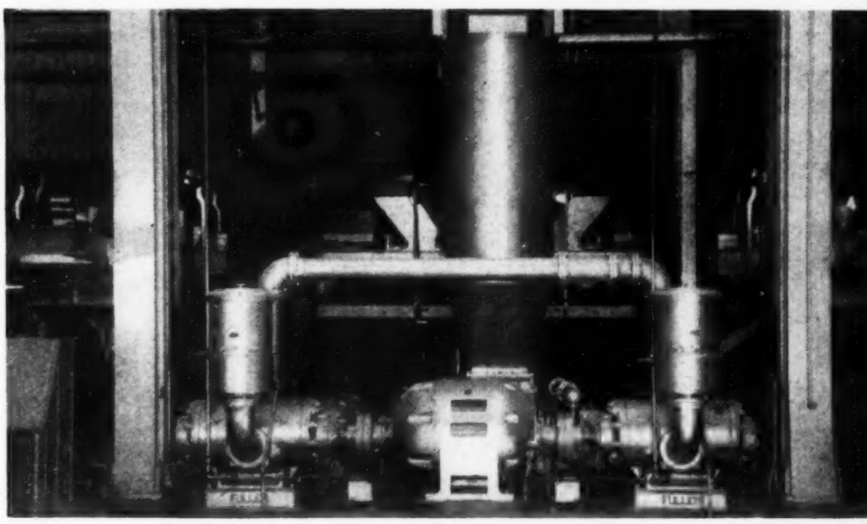
conveyed by drag chain into the clinker feed bins.

Proportioning of clinker and gypsum is done by 24-in. x 13-ft. Merrick Feedoweights identical to those that proportion raw materials. There are two for clinker, two for gypsum and two for high-lime stone for use as required in the manufacture of masonry cement. Feed into each mill is via a 37-ft. 6 in. inclined belt conveyor.

Product of each mill is conveyed by a 24-in. screw conveyor at floor level back toward the feed and where the elevator is located, which completes the circuit, with an overhead screw conveyor, to the air separator. Thus, the way is kept clear for the overhead travelling crane to serve both raw and finish mills and the kiln floor. Rejects from the air separators return into the first mill compartments; cement is conveyed by right and left hand screw conveyors into surge bins (2) over 7-in. Fuller-Kinyon pumps. Grinding mills, the air separators and bucket elevators are operated under suction from a Norblo bag-type dust collector, one for each circuit, and collected dust is introduced into the conveyors carrying finished product. Cement is delivered into storage at the old mill, where there is 170,400 bbls. capacity in 12 silos. Four 4-spout Bates packers thus serve both mills. Shipments are made in bulk or sacks by rail and in sacks by truck.

Power-Instrumentation

Electric power is purchased from the local power company to supplement an excess available from plant No. 1. Incoming electrical energy is stepped down from 69,000 volts to 4160 volts by two 3750-5000 kv.a transformers. In turn, electricity at 4160 volts is fed to five unit load centers at strategic points in the plant for step down to 440 volts, the potential for all electrical equipment except the large synchronous motors driving



Equipment for pumping cement into silos

ball and tube mills which operate at 4160 volts.

In the substations are all starting equipment and instruments for motors throughout the part of the plant served by a given substation. Start and stop buttons are located on main control panels in each substation but there are also emergency buttons and lock switches on the individual motor drives. Substations are pressurized. Each has a small American ventilator fan blowing filtered air into the structure to maintain a slight pressure and thus keep dust out.

DEVIL'S SLIDE PLANT

BASICALLY the Devil's Slide, Utah, new plant is the same as the mill, just described, with identically the same capacities department by department, and differs only in a few details.

The layout of the crushing plant differs, of course, because of topographic conditions and there is no need for long conveyor belt transportation, the quarry and crushing plant being much closer to the cement plant. A new P & H shovel and two Euclid trucks will go into service. The primary breaker is a 42-in. Allis-Chalmers McCully gyratory crusher to reduce a massive stone of much different characteristics than the thin, slabby stone crushed by a roll at Portland. Stone discharges from the primary into a three-ton surge pocket from which a 36-in., 170-ft. centers, belt conveyor is fed.

Similar iron detection and removal devices are employed, as at Portland, and sizing is done over two 6- x 12-ft. Allis-Chalmers Ripl-flo 2-deck vibrating screens. Secondary reduction is through a 15-50 Pennsylvania impactor and oversize is re-circulated over the screens, returning by belt conveyor to the three ton hopper previously mentioned. A 30-in. belt conveyor, 170 ft. 6 in. centers, equipped with a Merrick weightometer transports minus ¾-in. stone into raw materials storage. Dust is collected by a single Norblo No. 440 bag-type collector and discharged on to the 30-in. conveyor.

The kilns are to be fired by Raymond No. 493 direct-firing unit coal mills rated at 12,000 lb. of coal per hr., and auxiliary storage and handling facilities for coal were provided at the far end of the storage building, measuring 40 ft. by 78 ft. wide and 24 ft. high. Reserve storage is 1800 tons and an auxiliary 122-ton conical-bottom bin, kept full directly from the railroad cars, is the source of feed via screw conveyor and bucket elevator to 38½-ton conical mill feed bins. Equipment consists of a 14- x 21-ft. track hopper, a Jeffrey-Traylor vibrating pan feeder, 24-in. conveyor and a bucket elevator into the 122-ton coal pocket.

Raw mill capacity is 235 bbl. per hour, identical to Portland, but grinding mills are 3 ft. longer due to the tougher grindability of Devil's Slide limestone as determined by grindability tests. The ball charge is 13½ tons more and the drives are 700-hp. synchronous motors compared to 500 hp. at Portland. Half the loading of the primary mill is of 3½-in. forged steel balls, 30 percent of 3-in., and 20 percent of 2½-in. size. Loading of the secondary mill, also 9 ft. 6 in. by 13 ft. 2 in., is 57,000 lb. of 2-in., 34,000 lb. of 1½-in., and 23,000 lb. of 1¼-in. balls.

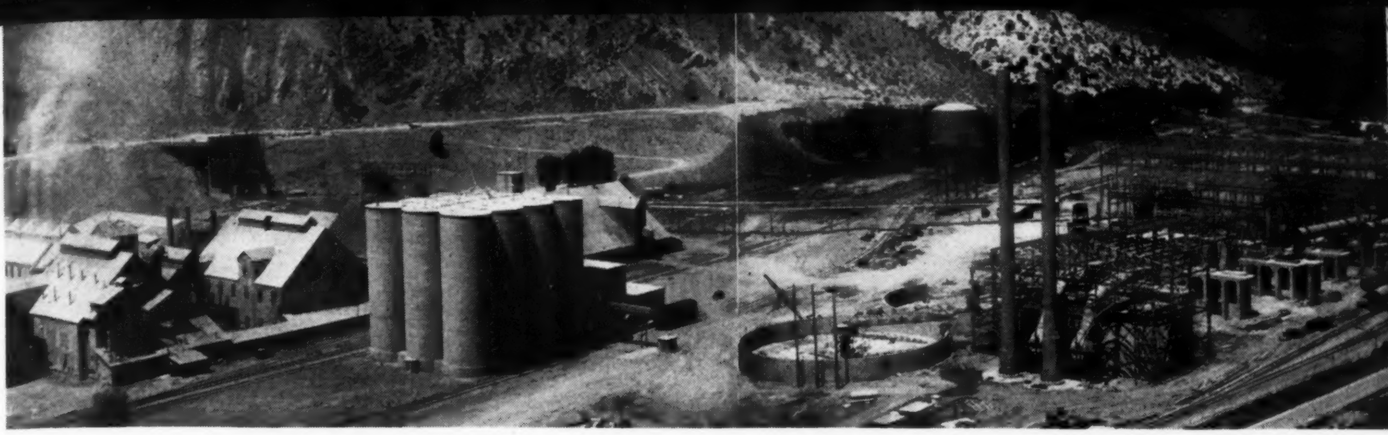
Thickeners at Devil's Slide are 125-ft. diameter with a 12-ft. depth at the concrete retaining wall, this stone having a much faster settling rate. Pomona deep well pumps handle the makeup water at this plant.

Finished cement is pumped into existing silos at mill No. 1, but in this case a modern stockhouse and packhouse designed to permit the handling of five cements without danger of contamination was completed prior to the new cement mill construction.

Storage capacity is 180,000 bbl. in twelve 30- x 90-ft. concrete silos and six interstices. The storage capacity in the plant No. 1 bins is 75,000 bbl., making a total of 250,000 bbl. The arrangement consists of three rows of four silos and two rows of three interstice bins, each in a direct line with a packing machine at the loading out room. Thus, there are five independent production lines, each with separate conveyors, elevating equipment and tramp iron screens.

In each case, a motor-driven feeder releases cement from a silo, or bin, into an 18-in. screw conveyor below, which transfers into a bucket elevator for passage over a 2- x 5-ft. single-deck dust-tight Selectro vibrating screen with No. 4 mesh music wire screen. Rejects are disposed of and the cement drops into an 80 sack packing

Aerial view of Devil's Slide plant under construction. New plant is on right; old plant in foreground with new silos and packing plant to serve both. Quarry is on the left. Beyond old mill may be seen the new crushing plant framework with belt conveyor to new mill



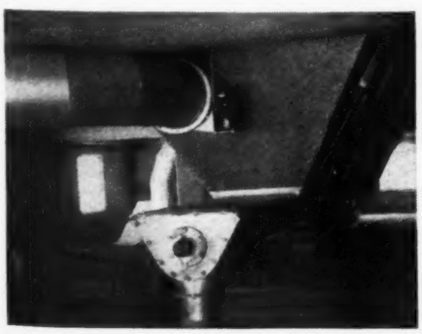
Panorama view of new Devil's Slide plant, showing part of old mill, to the left

machine hopper. When the hopper is filled, it overflows to a screw conveyor emptying into a circulating bin. There are two circulating bins on each of the five packing lines, back of the packer. Each line is interlocked through a power distribution system to enable the operator to have full control of operations by means of a selection box at the packing machine.

Packing machine hoppers and circulating bins have bin-dicator automatic level controls. When the packing machine hopper is at the low level, the silo feeder automatically starts and operates until the packer hopper and its circulating bins are full. Then, the bin-dicator on the circulating bin stops the silo feeder and it will not start up again until the circulating bins are empty. Feed out from circulating bins is controlled by the level indicator on the packer hopper and will operate only as cement is drawn from the packer bin. Conveying equipment and the packing machines are served by a Norblo dust arrester with compressed air shakers and the "dust" is returned into the circuit.

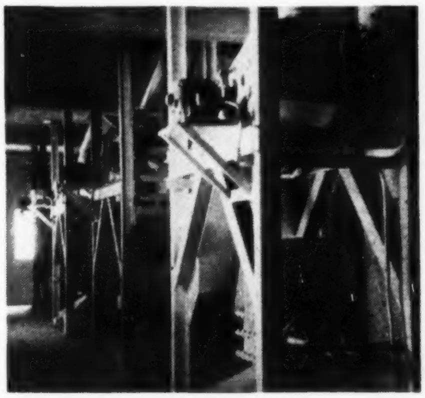
Five 4-tube Bates valve bag packing machines in a row are served by a 30-in. woven wire link conveyor, 106 ft. centers, so that any machine may load out to either side of the plant into railroad cars or trucks. In bulk loading, selection is made on the control box and all conveying equipment is operated from the scale house.

C. K. Boettcher is president; G. W. Ballantyne, secretary - treasurer of Ideal Cement Co., and Cris Dobbins, executive vice-president and general manager. M. O. Matthews is vice-president and general manager of the Southern Division with headquarters at Ada, Okla. Thos. B. Douglas, as general superintendent, is in direct charge of production and engineering.



One of the dust collectors at Devil's Slide plant

George Wiley, general engineer, headed the company's engineering staff which developed the general design with the aid of executives and operating officials throughout the company. W. R. Bendy, prominent cement plant engineer, was engaged as consultant. The Stearns-Roger Manufacturing Co., Denver, Colo., contractors and engineers of many years experience in the mining field, performed the detailed engineering and built both plants. G. T. Horlbeck and Hugh Connor, of Ideal Cement Co., are project engineers at Portland and Devil's Slide, respectively, and were actively in charge of field engineering during the construction.



Screens for cement before filling packing machine bins

Plant operations are assisted by J. C. Andrews, division superintendent for the Northern Division and C. Rodarmel, for the Southern Division. S. A. Gretencort is plant manager at Portland with John Baker as assistant superintendent. J. G. Connell is plant superintendent at Devil's Slide.

Kiln Record Performance

(Continued from page 119)

the best burning qualities and produced a very good cement:

SiO_2	14.34
AL_2O_3	3.87
Fe_2O_3	1.99
CaO	42.71

The fineness is 90 to 91 passing the 200-mesh, moisture 36 percent.

To encourage the burners to keep the kilns running as long as possible a bonus is given of one dollar per day and per kiln, after each kiln has run 150 days. This has given very good results. When anything happens they immediately try to solve it and if they can't, they call on the Superintendent.

Kiln No. 2 started again on November 8, 1947 and is still running in perfect shape; 218 days.

Our Kiln No. 3 was started on October 1, 1947 and is still running in perfect shape; 257 days.

Protection Against Lightning for Mines

NEEDLESS LOSSES of life, property and equipment at surface and underground mining plants are reported from time to time because of the failure to exercise precautions during electrical storms and the lack of adequate protection against lightning, according to a Bureau of Mines publication entitled "Protection Against Lightning at Surface and Underground Mining Plants."

Six cardinal preventative measures are suggested in the circular, including: strict adherence to codes and regulations established for safe blasting procedure and prevention of accidents; careful supervision of blasting methods; installation and maintenance of lightning arresters at strategic locations; and frequent checking of insulation on rotating machinery and transformers.

A free copy of the report, Information Circular 7447, may be obtained by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Penn.

Vermiculite Deposit

A DEPOSIT of vermiculite in large crystals has been discovered in the Wichita Mountains, Okla., according to the Oklahoma Geological Survey. Extent of the deposit has not yet been determined, but in general, the vermiculite is associated with feldspar in a granite pegmatite dike. The feldspar is the most abundant mineral, with the vermiculite occurring between the feldspar crystals. Crystal quartz is a minor constituent of the dike. The vermiculite appears to make up about a fourth of the vein material.

IDEAL'S Houston Plant Improvements

General view of Houston, Texas plant of Ideal Cement Co.

Increase grinding capacity, install new kiln, and wet type dust collector at Houston, Texas plant of Ideal Cement Co.

By W. B. LENHART

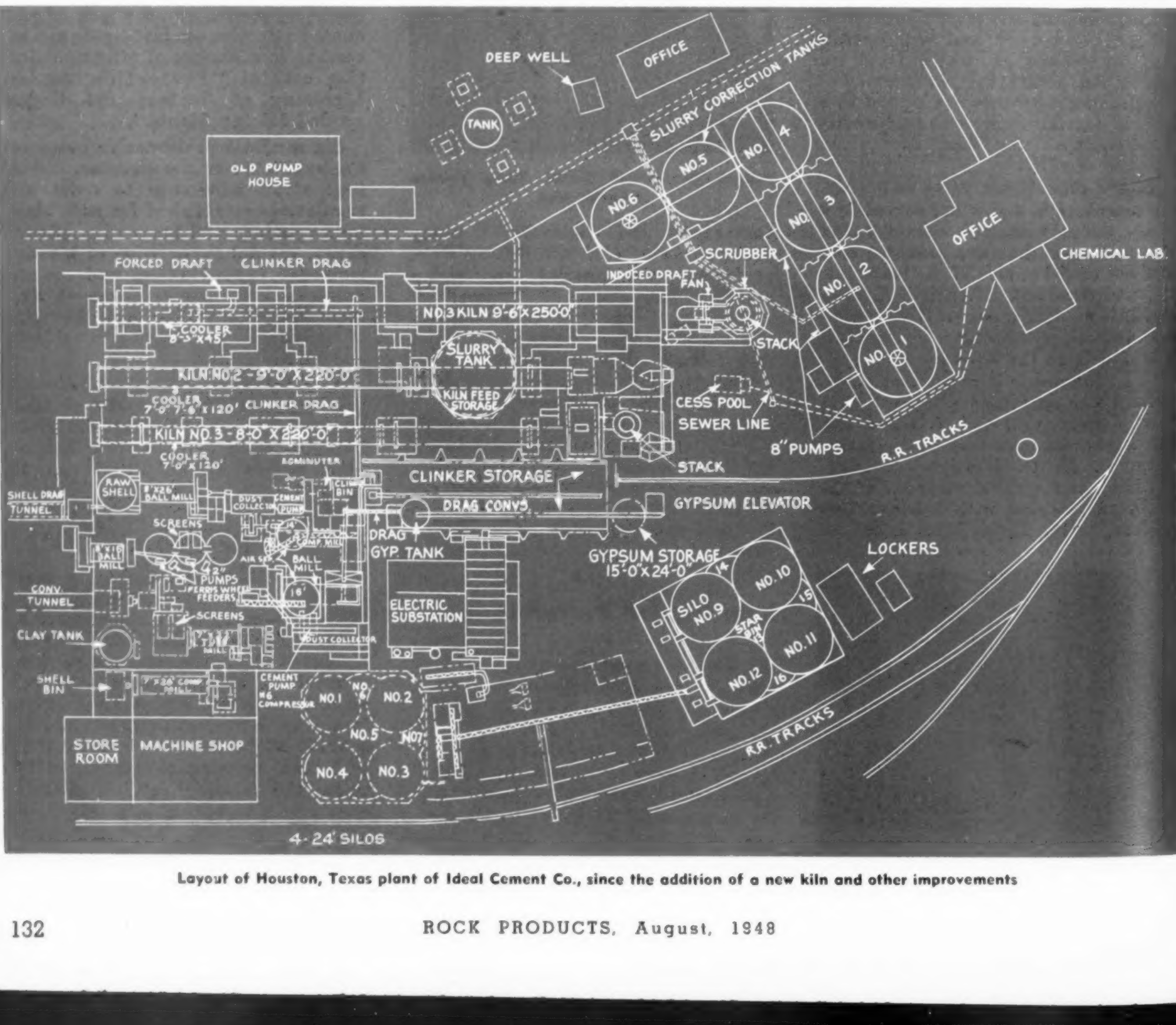
DURING the past year the Ideal Cement Co., has been making changes, enlargements, and additions at its Houston, Texas, plant that will make it almost a new plant with the completion of changes still in progress. This operation, formerly referred to as the Gulf Portland Cement Co., is located on the north side of the Ship Channel, Clinton Docks.

For raw material the plant uses oyster shells dredged in the Gulf of Mexico areas and transported to the company's docks in barges. Shells are delivered on a contract basis but the company has its own clay mining operation. The haul for the shells is about 40 miles.

Raw Grinding

At the plant, the concrete unloading dock has been built with reclaiming tunnels below in which drag chain conveyors move the shells to the raw grinding section. Barges are unloaded by a Marion clamshell.

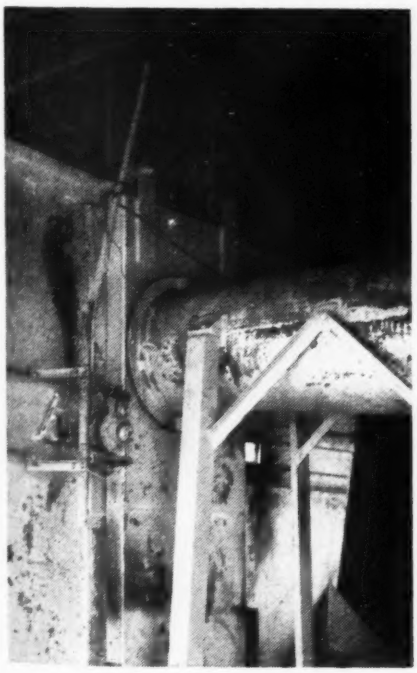
On the raw grinding side a new 8- x 26-ft., 3-compartment, Traylor ball mill has been installed. The shells are fed to the mill by a Jeffrey vibrating feeder with a screw to introduce them into the ball mill. The ball mill operates in closed circuit through a 6-in. Wilfley pump and two 4- x 7-ft. Jeffrey vibrating screens. Throughs from the screens (18-mesh) go to two circular storage tanks for ground shell slurry and the oversize is returned to the grinding circuit. Along-



Layout of Houston, Texas plant of Ideal Cement Co., since the addition of a new kiln and other improvements

side the two storage tanks for shell slurry is the clay slip storage tank. The clay and ground shell slurry is delivered to Ferris wheel feeders on each tank by individual 2-in. Wilfley pumps and the blend is sent to a new 8- x 16-ft. two-compartment Traylor ball mill. The slurry from this ball mill is picked up by a 3-in. Wilfley pump of special design, known as a 3-C-A. The suction of this pump is higher with respect to the shell than in the conventional design to enable it to pump the slurry a considerable distance. This pump delivers the slurry to the six storage tanks about 450 ft. distant with a vertical lift in the 35-ft. range.

These new steel storage tanks are each equipped with Dorr agitators. The tanks are circular and arranged in an "L" shape with four tanks on the long leg and two on the short. Tanks Nos. 1, 2, 3 and 4 on the long leg, provided with four 8-in. Wilfley pumps located at ground elevation, are fed from the bottom and center of the tanks. The tanks, mounted above the ground about 7 ft., are supported by structural steel members. Suitable 8-in. gate valves in the discharge lines permit the pumps to deliver slurry to other tanks in the group for blending purposes. Tanks Nos. 5 and 6 have two 2-in. Wilfley mixing pumps. These tanks are 35 ft. in diameter and 30 ft. high with a catwalk of steel over the top. The pumps all use conventional cast iron liners and replacement parts. In the older part of the mill, on the raw grinding side, is a 7- x 9-ft. ball mill followed by two 4- x 7-ft. Jeffrey vibrating screens with the undersize going to a 7- x 22-ft. tube mill. The shell and the clay slurry is then fed to a 7- x 26-ft. compartment mill from which the material is pumped to the slurry blending and storage tanks.



Close-up of firing end of kiln showing high-pressure gas burner

Paralleling the two older kilns is a new 9-ft. 6-in. by 250-ft. Traylor kiln. The new gas-fired kiln has an 8-ft. 3-in. by 45-ft. Traylor tubular cooler. Apparatus on the control board includes: two Foxboro potentiometers on the kiln discharge gases, a gas flow meter, and a Leeds-Northrup draft controller indicator on back end of fan damper control.

Wet Type Dust Collector

The kiln discharges to a wet type dust collector that was a part of the sintering plant of the Aluminum Company of America at the Mobile, Ala., operation. It was fabricated by the Chicago Bridge & Iron Co. for Alco. A cooler, consisting of four groups of circular water sprays, is mounted above two collector cones. Cases from the kiln enter the side of the device just above the top collector cone. The entire assembly is of steel construction and is 11 ft. in diameter and about 100 ft. high.

No. 1 and 2 kilns are the older units. No. 2 kiln is 9- x 220-ft. with a 7- x 120-ft. rotary cooler. This cooler was recently revamped and new Vulcan rolls installed as a repair job. No. 1 kiln, which is 8- x 220-ft., has a 7- x 120-ft. cooler. Both kilns exhaust to a 165-ft. stack. They use a Clipper saw for sawing firebrick and kiln lining material.

Plant capacity is now 3500 bbl. per day. The new kiln when new chains and the previously mentioned stack fan are installed is expected to turn out 1500 bbl. per day.

On the finish side the company is installing an 8- x 30-ft. Traylor, three-compartment ball mill that will be provided with a 16-ft. Sturtevant separator and a Northern Blower Co. dust collector.

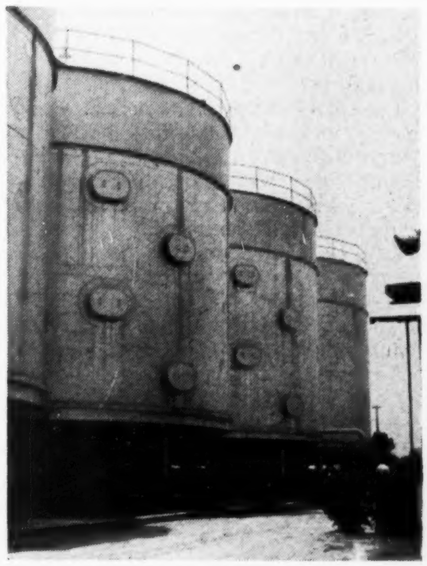
No new clinker storage has been provided nor were additional storage silos built. At present there are two banks of silos. Silos Nos. 1, 2, 3 and 4 are in a bank of four. Silos No. 5, 6, 7 and 8 are star bins in this assembly and the three outside are interstice compartments, respectively. These silos are 24 ft. in diameter.

In the other group of silos, Nos. 9, 10, 11 and 12 are 30 ft. in diameter and arranged in a cluster of four. Silos Nos. 13, 14, 15 and 16 are star bins and the three outside are interstice compartments, respectively. On this bank, between silos Nos. 9 and 12, a man-lift, electric driven, has been provided.

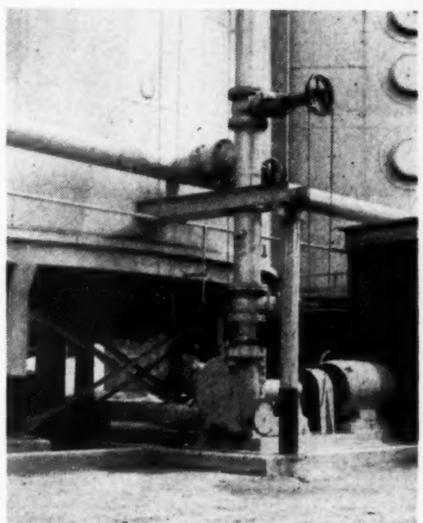
The packhouse is equipped with two Bates packers, three- and four-tube machines, respectively.

Construction and alteration work at this plant was under contract to the Stearns-Rogers Co. of Denver, Colo. Harold Lamont is plant superintendent; J. L. Conerly, assistant plant superintendent, and F. A. Lee, chief chemist.

Wet-type stack dust collector on new kiln



New Slurry storage tanks



One of the slurry pumps under storage tanks

Fuel Economy

SLURRY FILTERS Save Coal

Peerless Cement Corporation, Detroit, Mich., cuts coal costs 30% per unit of production

By BROR NORDBERG

SLURRY FILTERS and improved design turbo-generators are proving effective in reducing coal consumption at the Detroit, Mich., plant of Peerless Cement Corp. Since installation of this equipment in 1946, the purchase of supplemental electric power is no longer required and total coal saved amounts to 30 per cent per unit of production.

This plant is a waste heat, wet process operation with three 11- x 175-ft. rotary kilns. Its location is a short distance from downtown Detroit in an industrial section, where room for expansion is necessarily limited.

Like other waste heat boiler plants in the industry, this mill originally generated its total power requirements from waste heat. Increasing power demands later necessitated a supplemental source of power. A B & W boiler fired by B & W unit coal pulverizers was installed to develop steam for generating that auxiliary power. Its capacity is 40,000 lb. of steam per hr. at 200 p.s.i.

During recent peak production years, power demands continued to increase, with the result that substantial purchases of electrical power became necessary over and above that generated by the plant. The installation of filters and modern equipment for power generation was designed to eliminate the need for any purchased power, to reduce the fuel requirement for auxiliary boiler operation, and to cut the coal consumption per bbl. of clinker produced.

The kilns are pitched ⅜ in. to the lineal ft. and, prior to installation of the filters, were driven at 40 r.p.h. Production averaged 3900 bbl. of clinker per day for the three kilns. Each kiln is equipped with a Vanderwerp heat recuperator, is operated under induced draft, and travel of the exit gases is through superheaters, waste heat boilers, the economizers and Multiclone cyclone dust collectors consecutively to exhaust to the stacks. Raw materials for cement manufacture are limestone shipped in by water from Calcite, Mich., clay and by-product calcium carbonate.

Filter Installation

In order to accommodate the filters, it was necessary to raise the mill building at the feed ends of the kilns. The columns on which the roof trusses are supported were extended 18 ft., and an overhead room measuring 80 ft. wide and 60 ft. long was built. It also accommodates dust storage bins of 80 tons total capacity.

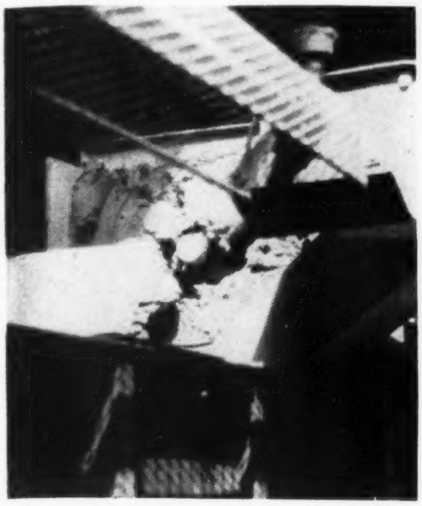
Each kiln has two 12-ft. 6-in. diameter Oliver United disc-type filters and each filter has eight discs. There are 15 replaceable segments to a disc and 200 sq. ft. of cotton duck filter cloth. With a pair of filters to a kiln, one could be taken out of service in emergency and the kiln could continue to be operated at reduced capacity. The filters operate under 28-in. vacuum and are driven by 7½-hp. motors. Auxiliary equipment comprises conveying equipment for filter cake and for dust, a pug mill for intermixing the two, and vacuum pumps.

One of three Ingersoll-Rand vacuum pumps is standby. Two are 26- x 12-in., 3780 c.f.m. piston displacement units, each driven at 257 r.p.m. by a 125-hp. motor; the third is a 27- x 14-in. unit, 3700 c.f.m. displacement, driven at 200 r.p.m. by a 150-hp. motor. The requirement for filtering is 0.8 c.f.m. per sq. ft. of cloth surface.

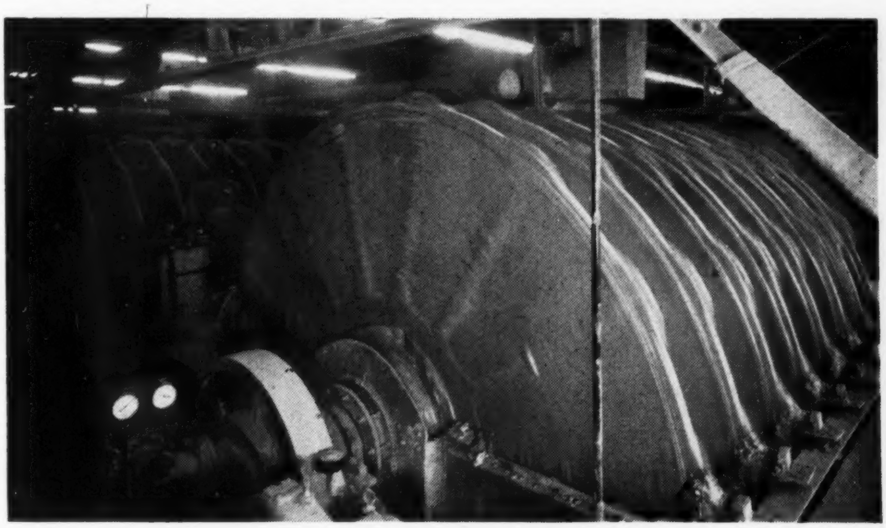
Feed material comprises a limestone-clay slurry ground to a fineness of 90 per cent minus a 200-mesh sieve, into which the by-product calcium carbonate slurry has been thoroughly blended. Of 610 lb. of raw materials required per bbl. of clinker, approximately 50 lb. is high lime slurry, raising the calcium carbonate content from 74 to 78 per cent. Ferris wheel feeders regulate the flow of slurry into the filter tanks. Moisture content of the slurry as fed to the filters is 39 per cent and the reduction, in the cake to be fed the kilns, is to 21 per cent. This compares with 33 per cent H_2O in unfiltered slurry as fed into the kilns prior to installation of the filters.

Fuel savings per bbl. of clinker produced were considerable from the start of operation. Production of clinker has increased consistently as experience was accumulated in operating the filters, and particularly as methods of feeding the filter cake and the inter-blending of dust with the cake were perfected. Uniformity of feed into the kilns had to be attained in order to realize maximum production

Pug mill feeder discharges into kiln spout. Note above, how dust is fed in to pug mill. Kiln feed spout shown, lower left



Showing action of knife cutter shaving off filter cake into pug mill as it extrudes from screw



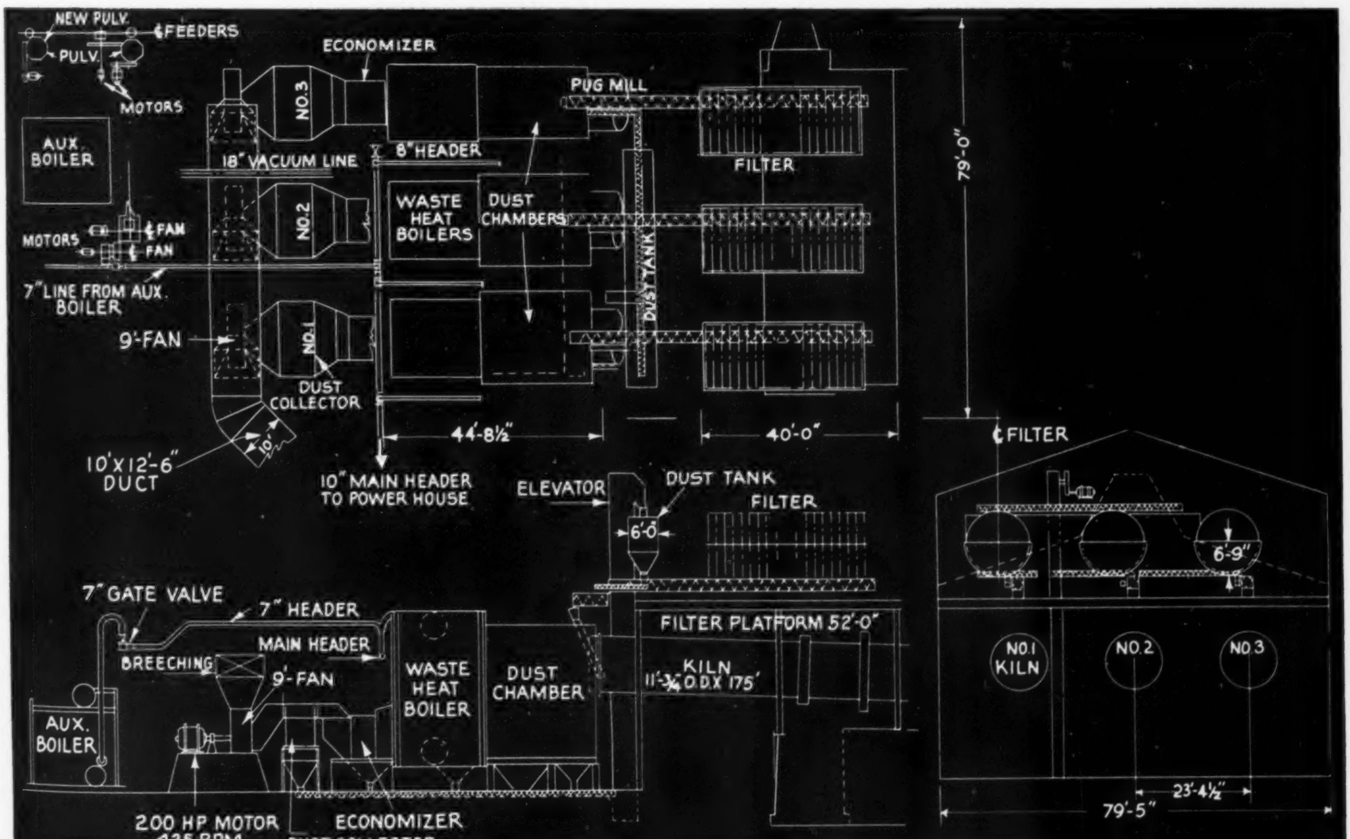
Close-up of one of the slurry disc-type filters

and, in this respect, methods that were developed are of interest. The usual practice of first inter-blending dust with the filter cake is followed, to impart the necessary granular texture to facilitate flow through the feed spouts into the kilns. Forty-five pounds of dust is so required for every bbl. of product, which utilizes all the material accumulated in the dust chambers and cyclone collectors. Formerly this dust was wasted.

The kiln motors were re-wound to permit an increase in kiln speed from 40 r.p.h. to 60 r.p.h. in order to facilitate the flow of feed material quickly through the back ends of the kilns into zones of higher temperature. Heat is another aid to flow of filter cake and insulated steel feed spouts inclined at 60 deg. were installed to project down into the kilns. As an added precaution, 17-ft. lengths of chains were installed for a distance of 8 ft. inside the back ends of the kilns, to break up any accumulations of material that might occur. Changes in methods of conveying filter cake from the filters, and in the handling of dust for inter-mixing with the cake, were made recently to improve the uniformity of mix and the regularity of flow into the kiln feed spouts.

Originally, cake from the filter discs was conveyed by belt into a 7-ft. pug mill where dust was introduced by a cross screw conveyor from the dust bins. Two dust bins serve each kiln by way of a common screw conveyor.

The dust bins have been equipped with positive star feeders and with continuously-operated agitators that



Plan, side and elevation drawings showing filter installation with relation to the kilns and related equipment at exhaust end

SLURRY FILTERS Save Coal

Peerless Cement Corporation, Detroit, Mich., cuts coal costs 30% per unit of production

By BROR NORDBERG

SLURRY FILTERS and improved design turbo-generators are proving effective in reducing coal consumption at the Detroit, Mich., plant of Peerless Cement Corp. Since installation of this equipment in 1946, the purchase of supplemental electric power is no longer required and total coal saved amounts to 30 per cent per unit of production.

This plant is a waste heat, wet process operation with three 11- x 175-ft. rotary kilns. Its location is a short distance from downtown Detroit in an industrial section, where room for expansion is necessarily limited.

Like other waste heat boiler plants in the industry, this mill originally generated its total power requirements from waste heat. Increasing power demands later necessitated a supplemental source of power. A B & W boiler fired by B & W unit coal pulverizers was installed to develop steam for generating that auxiliary power. Its capacity is 40,000 lb. of steam per hr. at 200 p.s.i.

During recent peak production years, power demands continued to increase, with the result that substantial purchases of electrical power became necessary over and above that generated by the plant. The installation of filters and modern equipment for power generation was designed to eliminate the need for any purchased power, to reduce the fuel requirement for auxiliary boiler operation, and to cut the coal consumption per bbl. of clinker produced.

The kilns are pitched ⅜ in. to the lineal ft. and, prior to installation of the filters, were driven at 40 r.p.h. Production averaged 3900 bbl. of clinker per day for the three kilns. Each kiln is equipped with a Vanderwerp heat recuperator, is operated under induced draft, and travel of the exit gases is through superheaters, waste heat boilers, the economizers and Multiclone cyclone dust collectors consecutively to exhaust to the stacks. Raw materials for cement manufacture are limestone shipped in by water from Calcite, Mich., clay and by-product calcium carbonate.

Filter Installation

In order to accommodate the filters, it was necessary to raise the mill building at the feed ends of the kilns. The columns on which the roof trusses are supported were extended 18 ft., and an overhead room measuring 80 ft. wide and 60 ft. long was built. It also accommodates dust storage bins of 80 tons total capacity.

Each kiln has two 12-ft. 6-in. diameter Oliver United disc-type filters and each filter has eight discs. There are 15 replaceable segments to a disc and 200 sq. ft. of cotton duck filter cloth. With a pair of filters to a kiln, one could be taken out of service in emergency and the kiln could continue to be operated at reduced capacity. The filters operate under 28-in. vacuum and are driven by 7½-hp. motors. Auxiliary equipment comprises conveying equipment for filter cake and for dust, a pug mill for intermixing the two, and vacuum pumps.

One of three Ingersoll-Rand vacuum pumps is standby. Two are 26- x 12-in., 3780 c.f.m. piston displacement units, each driven at 257 r.p.m. by a 125-hp. motor; the third is a 27- x 14-in. unit, 3700 c.f.m. displacement, driven at 200 r.p.m. by a 150-hp. motor. The requirement for filtering is 0.8 c.f.m. per sq. ft. of cloth surface.

Feed material comprises a limestone-clay slurry ground to a fineness of 90 per cent minus a 200-mesh sieve, into which the by-product calcium carbonate slurry has been thoroughly blended. Of 610 lb. of raw materials required per bbl. of clinker, approximately 50 lb. is high lime slurry, raising the calcium carbonate content from 74 to 78 per cent. Ferris wheel feeders regulate the flow of slurry into the filter tanks. Moisture content of the slurry as fed to the filters is 39 per cent and the reduction, in the cake to be fed the kilns, is to 21 per cent. This compares with 33 per cent H_2O in unfiltered slurry as fed into the kilns prior to installation of the filters.

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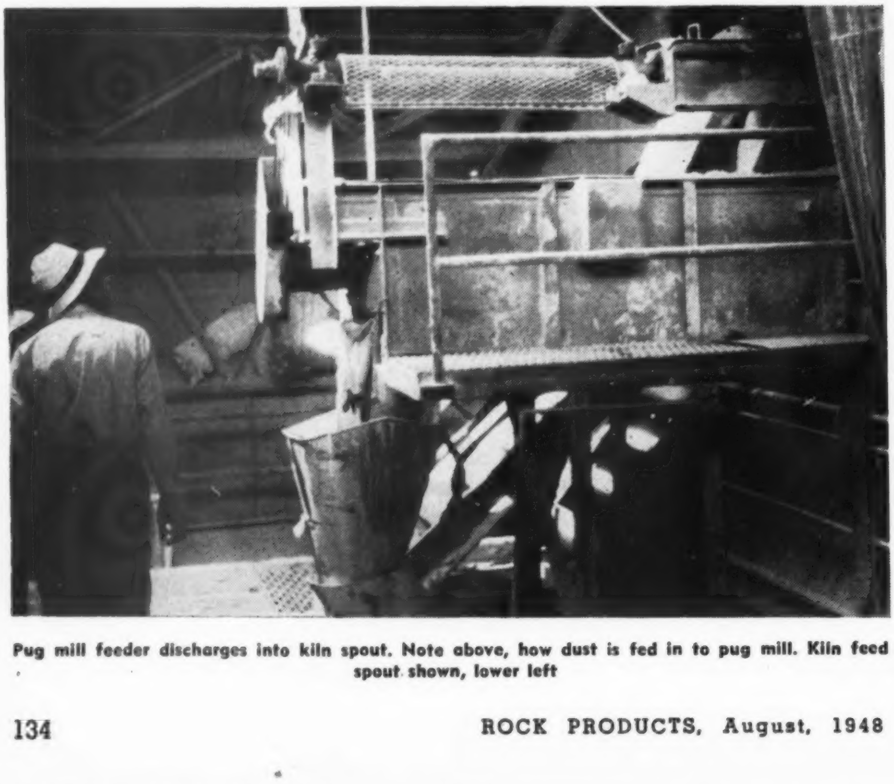

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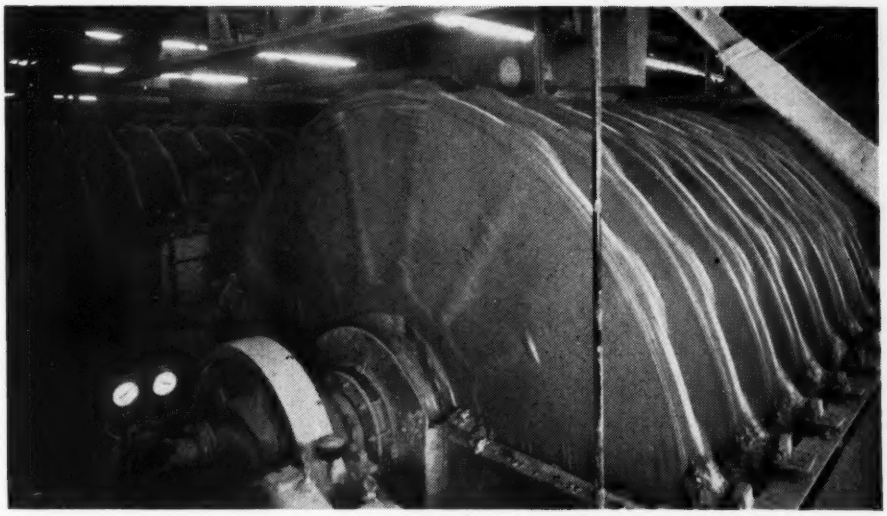
Showing action of knife cutter shaving off filter cake into pug mill as it extrudes from screw



Close-up of one of the slurry disc-type filters

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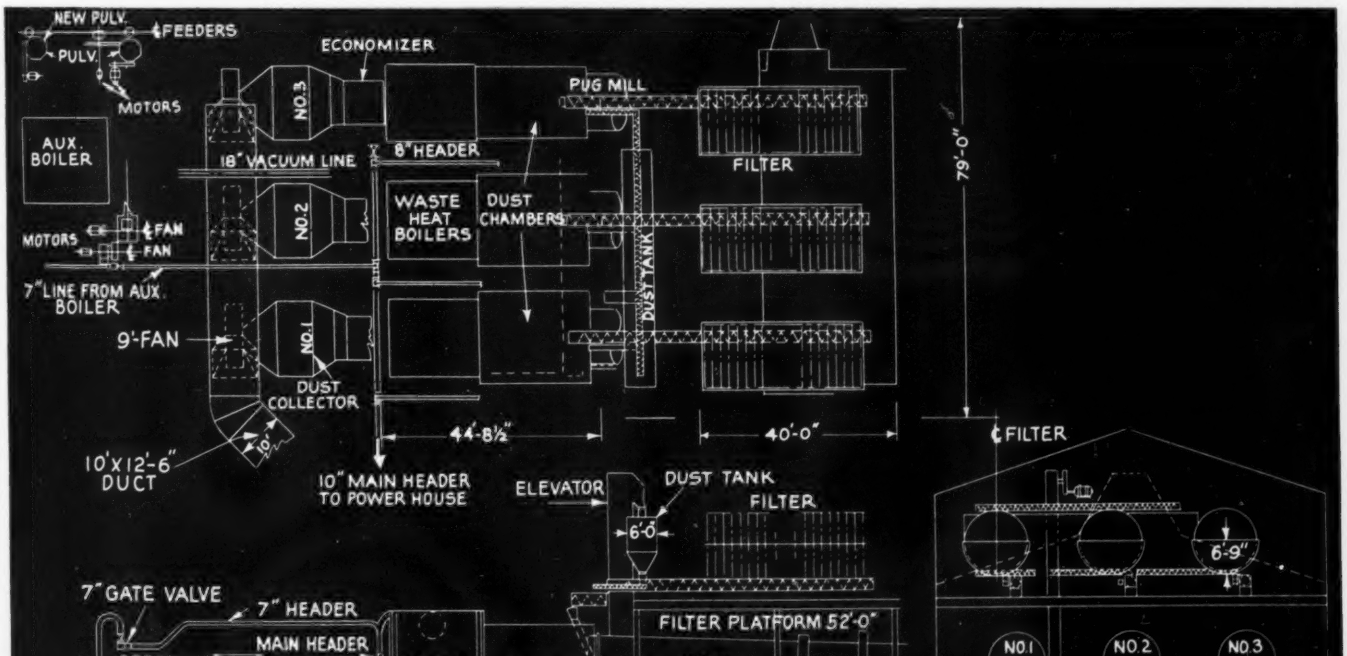


Plan, side and elevation drawings showing filter installation with relation to the kilns and related equipment at exhaust end

Showing how filter cake is fed to pug mill below by spiral screw, left above

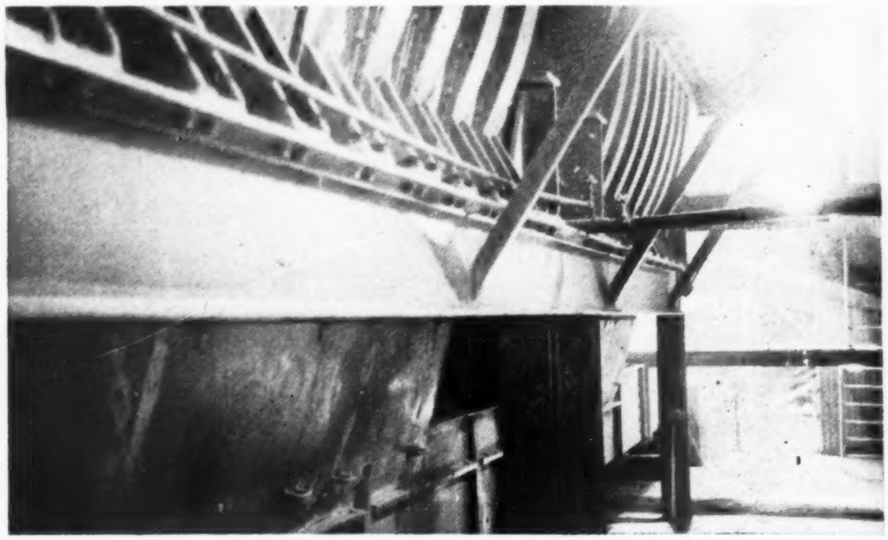
consist of revolving blades turned on a shaft inserted through the bins above the feeders. The filter cake belt conveyors have been replaced in each case by 24-in. diameter ribbon screw conveyors with 2½-in. flights. Each extends under both filters serving a

Transfer of filter cake and dust into pug mill. Above, to the right, is dust screw on left end of spiral screw fitted with cutoff knife

kiln and discharges into the pug mill. Dust is introduced at the feed end of the pug mill.

Conveying filter cake by a spiral screw has the effect of evening out the load whereas, with belt conveyors,

Each pair of dust bins has constant agitation and feeds out to a cross screw to pug mill where filter cake is also introduced



Showing spiral screw housing beneath filters. Pug mill in background

there were irregularities in rate of delivery to the pug mills. A detail that we believe contributes greatly to uniformity of rate of feed into each kiln is a knife cutter edge at the point of discharge from the spiral screw conveyor into the pug mill. The knife edge shaves off the cake and eliminates entirely the extrusion of large chunks of cake. Since these changes in handling methods were adopted, mud rings in the kilns have been practically eliminated and there has been no appreciable clinker ring formation. Production from the three kilns has been increased from 3900 bbl. to 4400 bbl. on the average daily.

Adjustments to the filters have prolonged filter cloth life to an average expectancy of 1500 bbl. of slurry filtered before replacement. The average replacement is one disc segment per day per kiln, which, we believe, is unusually low.

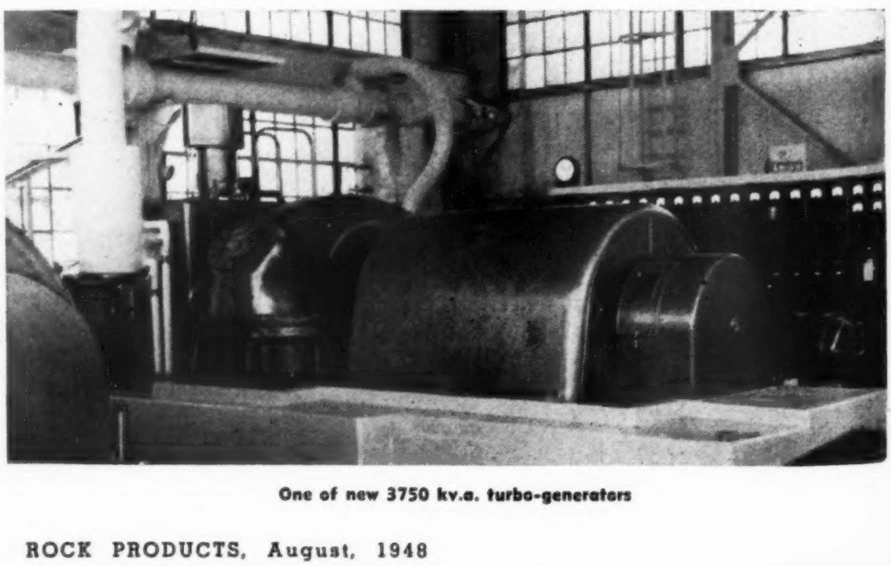
Kiln operation has not been changed with the exception of increased speed of rotation. Back end draft is still carried at 0.12 in. and exit temperatures are a little higher than the 1350 deg. F. carried before the filters were installed. More steam is being developed from the waste heat boilers mainly because a greater volume of exhaust gases is now available to the boilers because more clinker is being produced than before.

The plant has three 1000-hp. waste heat boilers and, for many years, has operated two 3750 kv.a. G.E. turbo-generators driven by steam at 200 p.s.i. pressure. Modern generating units of the same make and rating have much more efficiency in steam utilization and were installed as replacements simultaneously with the filter installations. The older units required 17.5 lb. of steam per K.W. of power generated; the new ones consume only 12.5 lb.

Performance Data

Before operation of the filters, fuel consumption averaged 170 lb. of coal per bbl. of clinker produced, of which 30 lb. was required to fire the auxiliary boiler. An average of 1,550,000 B.t.u. was needed to produce a barrel of clinker. The waste heat boilers pro-

(Continued on page 151)



One of new 3750 kv.a. turbo-generators

Cement shortages have spurred plans for many new plants and extensive modernization programs. Second article will discuss trends in design and equipment

Typical of the South American cement mills is the plant of Corporacion Cementera Argentina

LATIN AMERICA'S Expanding Cement Industry

By JOS. M. WOLFE*

SOUTH of the Rio Grande are countries rich in mineral resources which have been only partially developed, particularly in the field of industrial minerals.

From 1935 until 1941, a period of recovery from the depression of the early thirties, considerable activity existed in the construction of new cement plants in Latin America. During the last war, priorities for new cement-making machinery were not obtainable and, as the consumption of Portland cement in most Latin American countries rose sharply, consistent with increased industrialization and construction, the cement-making capacity of most countries became inadequate to fulfill the heavy demand. In some instances the margin of necessity was met after 1943 by imports, chiefly from the United States.

In consideration of the potential market for cement, certain existing cement companies in Latin America undertook expansion of their facilities during the war by acquiring second-hand machinery which was available then without priority. A number of new cement plants, notably in Chile and Mexico, were projected and built entirely with used machinery during the latter years of the war.

Large purchases of strategic raw materials from Latin America by the United States created hundreds of millions of dollars of credits some of which were definitely earmarked for the construction of new cement plants. The majority of these projects were abandoned, temporarily at least, due to lack of technical personnel and difficulties encountered in attempting to assemble a complete cement plant under wartime conditions and manufacturing restrictions.

Certain groups of interested business men and cement plant executives, realizing that proper negotiations for cement plant equipment could not be carried on during the war, nevertheless proceeded with the all important preliminary steps and engineering studies necessary to the establishment of any cement plant. They planned to begin actual construction and place orders for equipment immediately following the end of the war. Some of these projects, priorities for which were eventually granted in 1945, are now in process of completion, or have recently commenced operations, and should share in the expanded market for cement throughout Latin America.

Several projects, for which second-hand equipment was obtained in 1944 and 1945 for the purpose of increasing local cement manufacturing capacity, are in production. Additional new items of equipment such as air-quenching coolers, chain systems, air separators, kiln instruments, and other auxiliary apparatus have been included in some of these projects for the purpose of improving the overall efficiency of the used machinery, a great deal of which was acquired from outmoded cement plants. In most instances, it may not be possible to attain the fullest advantages afforded by modern cement-making machinery. However, it is expected that a fairly high level of efficiency will be reached to permit economic operation as long as consumption continues to exceed local production.

Some plant operators discarded tentative plans for layouts involving used equipment and have undertaken steps for a complete rehabilitation and modernization of their units. Some have revised their schemes for new plants to incorporate the latest arrangements now performing successfully in plants in the United States. Extension programs that originally contemplated location of additional

*Engineer, Pyro-Processing Section, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Country	Number of Plants—March, 1948										Current Total Daily Capacity Metric Tons/Day	Average Rating Metric Tons/Day	Total Existing Plants All Types	Under Construction or Projected	
	50-80T		100-150		200-250		300-400		Over 400					New Plants	New Extensions
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet					
Argentina					3		1	1	2	4	5650	515	11	1	4
Bolivia			1								150	150	1		
Brazil	1		1			4			1	2	3100	345	9	1	1
Chile									1	1	1350	675	2		
Colombia				2		2		3		1	2100	263	8		3
Ecuador	1										75	75	1	1	
Peru									1		800	800	1		1
Uruguay				1						1	450	225	2		
Venezuela	1		1			3					900	180	5	1	2
Panama								1			300	300	1		
Guatemala	1										75	75	1		1
Nicaragua		1									70	70	1		
Mexico	1	1	4		7		2	1	1		3500	206	17	1	3
Cuba										1	500	500	1		
Puerto Rico								1		1	900	450	2		1
Total Plants	5	2	7	3	10	9	3	7	6	11	19,920	316	63	5	16
	Total Dry Process Plants 31 Total Wet Process Plants 32														

Fig. 1. Statistics of Cement Plants in Latin America Showing Number of Existing Plants in Each Country Within Ranges of Daily Capacity Selected; Proposed New Plants and Probable Extensions. [1 Metric Ton Equals 6 Barrels of 376 Lb. Each]

Daily Capacity	Process	Typical Country	Observations on Design
50-80 Tons	Dry	Bolivia, Ecuador, Guatemala	"Small Plant" Design—much hand labor—short kilns, poor fuel efficiency, no kiln Instrumentation—low capital investment Serves small local country market inaccessible to foreign cement—quality and economy not critical factors in operation
100-150 Tons	Wet or Dry	Brazil, Mexico, Colombia	Medium rated plants in which certain mechanical refinement and auxiliary equipment may be adopted or considerable hand labour retained. Many plants of this original rating built during 1925-1939 as initial ventures. Also during World War II with used equipment
200-250 tons	Wet or dry	Mexico, Argentina, Venezuela, Colombia	This capacity usually justifies broad mechanization and most modern appurtenances for maximum thermal efficiency and centralized materials storage building. Located in remote sections where scarcity of water exists and region is undergoing industrial development
300-400 Tons and larger	Generally wet	Argentina, Colombia, Brazil, Venezuela, Panama, Uruguay, Puerto Rico	May incorporate closed-circuit wet grinding and full mechanization with pre-engineered plant design indicating future expansion. These plants must meet rigid specifications and fairly intense domestic competition. Usually located close to industrial centers or areas of large consumption.
300-400 Tons and larger	Dry	Mexico, Chile, Peru	Involve modern blending systems and pneumatic transport of pulverized materials. Also, long kilns and heat recuperating devices as well as closed-circuit dry grinding in some instances.

Fig. 2

machinery adjacent to and to operate in conjunction with, old existing units have been altered to locate the new equipment independently in an integral unit. This attains maximum efficiency from modern, coordinated groups of machinery.

The motives for such modifications to original plans may be found in the growing realization that competition among cement producers would be greatly intensified after the sellers' market had passed. Latin American cement plant executives, in Mexico, Panama, Colombia, Venezuela, and Brazil particularly, recognized the developments that would occur after the immediate postwar market is satisfied. They are presently either building, or projecting for early construction, cement plants incorporating the most modern devices available for economy of fuel, power and labor as well as materials handling. The probable need to produce several types of cement of uniformly high quality has not been overlooked, and manufacturing flexibility is an important factor in the arrangement of the main materials storage building; also in the relationship of major equipment with auxiliaries and with intermediate storage and treatment facilities.

Such modern plants are either in process of actual construction or in process of final design, in the countries mentioned above.

Shortages of cement still exist in some Latin American countries; supplies from some European countries were being received, but such supplementary quantities were small compared to the actual requirements, and distribution of imported cement may be controlled by government agencies for purposes of fulfilling requirements of federal programs involving industrialization and development of hydraulic resources.

Exportation of Portland cement from the United States is currently under export control owing to the fact that recent monthly shipments from mills are exceeding production.

Capacity and Statistics

In 1940, the capacity of the average cement plant in this country (there are 163 plants) was 700 metric tons or 4200 bbls. per day. The average-sized cement plant in the world, according to data derived from an analysis of the industry, published in 1941, and titled "The Manufacture of Portland Cement", by William Anselm, a German cement engineer, was 400 metric tons.

In 1939 in Latin America, the average plant was rated approximately 300 metric tons or 1800 bbls. per day and this average is also valid today as shown in Fig. 1. Mexico had eight plants with an average rating of 150 metric tons in 1937, and now has 17 plants with an average rating of 205 metric tons. Ecuador and Bolivia each had one plant with a capacity of 75 tons which, in the latter country, has been doubled. Argentina, Brazil, Colombia, and Venezuela had plants, the ratings of which, on the average, was 300 metric tons in 1939. Chile and Uruguay each had cement plants

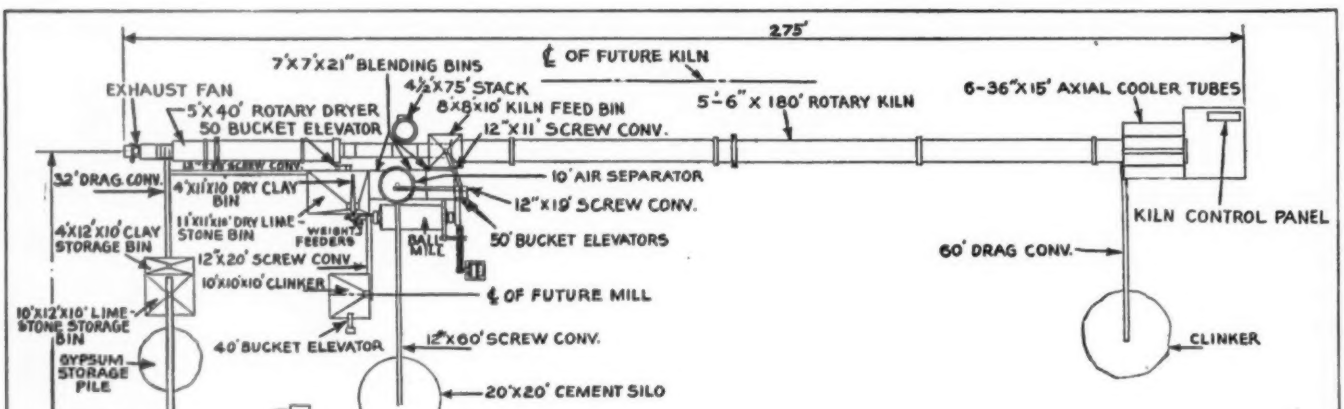


Fig. 3: Well-designed, small cement plant of 50 metric ton capacity. Waste heat drying of materials is practiced

whose ratings were, respectively, 1000 and 300 metric tons daily.

"The Cement Industry of Latin America", prepared by OLIVER BOWLES and R. B. MILLER and issued as Information Circular No. 7102 by the U. S. Bureau of Mines, is suggested as a reference on all phases of the industry there. The beginning and growth of the industry in each country is traced and fairly recent production figures are given. The situation of the Latin cement industry is reviewed from the standpoint of future demand and markets.

Although the above-stated figure of 300 metric tons per day may be taken as the average rating of Latin American cement plants, this includes many antiquated plants of small capacity, located in Central America and several small South American countries. The average also covers numerous plants of modern design and large capacity situated in the more importantly industrialized countries in South America and in Mexico. Most of the new plants that have materialized since 1944 appear to conform to the average capacity as it existed in 1939, although at least two new plants, each rated approximately 1000 metric tons per day, have been projected for construction within the next few years in Latin America.

Fig. 2 is a tabulation arranged to show four classifications of cement plants, each group corresponding to an arbitrary range of capacity. This has been selected for convenient grouping of comments pertaining to each classification. While it cannot be stated that any single capacity range predominates in certain countries, it will be observed that such a situation does exist to a limited extent.

Cement-making units both with second-hand and new equipment proposed for erection in Latin America since 1944 are classified into the same four convenient ranges of daily capacity in Fig. 1. This classification may also be applied to the initial ratings of many existing plants built since 1925 in those countries.

From the statistics in Fig. 1, it will be noted that Bolivia, Ecuador and Guatemala, each of which has one cement plant originally planned for a capacity of from 50 to 80 metric tons per day, are not countries in which local consumption normally warrants the construction of very high capacity cement plants. All three countries have small populations and the economy is largely based on agriculture. Cement is required mainly for roads and for buildings. However, the heavier demand arising from the spread of industrialization in those countries is beginning. One-third of Bolivia is a high mountain plateau separated from the rest of the country by mountain barriers. In Ecuador, the remoteness of the two principal population centers tends to slow the industrial growth of the country.

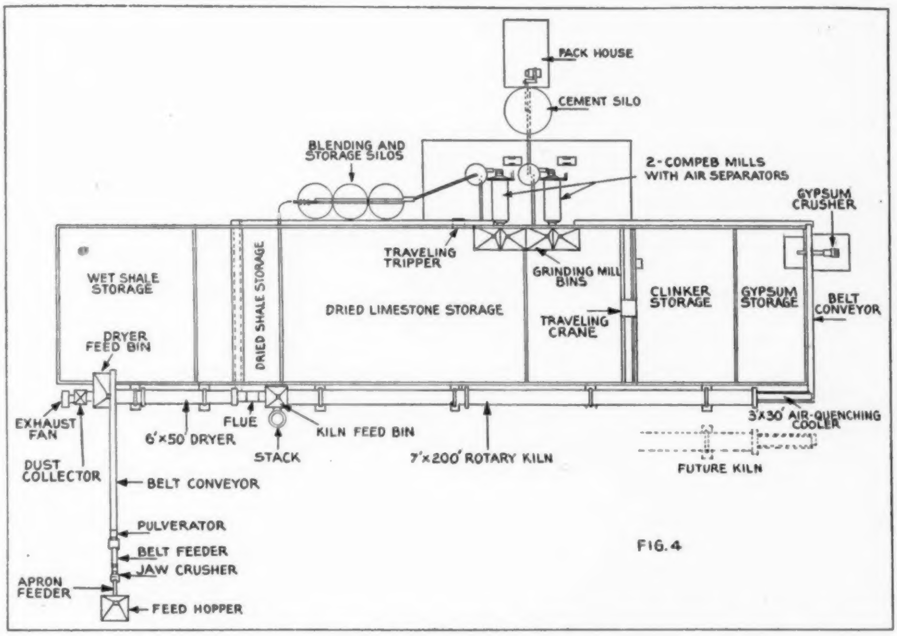


Fig. 4: A 100-metric ton cement plant

The original Bolivian cement plant had only one grinding mill that was employed alternately for raw and clinker grinding. In 1938, a clinker mill was added as well as an air-quenching clinker cooler. The layout of the plant is typical of "small cement plant" design; the plant is "L" shaped and the flow of material through the plant is undirectional or down the vertical leg and across the horizontal leg. There is no central storage for materials and the raw- and clinker-grinding mill buildings are separated.

Water is scarce at the site of this plant, as well as the one in Ecuador, and the natural dry state of the limestone in both instances justifies the dry process, although drying must be carried on during the rainy season. In Guatemala the situation is similar.

In Fig. 3, there is shown in outline a well-designed small cement plant of 50-metric-ton rated capacity, proposed for an isolated, arid region of Latin America, which permits a high order of flexibility of operations and lends itself well to expansion by the addition of a duplicate kiln and mill. Waste-heat drying of raw materials is practiced on account of probable high cost of fuel delivered to remote locations.

Cement-making machinery for 100 to 150 tons per day capacity involves a capital investment large enough to warrant the introduction of certain refinements in plant design: a centralized storage for materials, possibly an overhead traveling crane, pneumatic transport systems for distances that are not too short, a single building incorporating the raw- and clinker-grinding mills; devices making for high thermal efficiency in the kiln department may be considered when the plant is undergoing study by the designers. Fig. 4 shows a 100-metric-ton plant design incorporating the foregoing points.

The 150-ton plant should receive particular attention from the standpoint that, when the rating is doubled, there will result a 300-ton, or 1800-bbl., plant and should have appropriate efficient features of design consistent with this capacity. These elements should be inherent in the pattern of the original 150-ton plant. Thus, in the order named, consideration should be given to acquire auxiliary equipment of sufficient capacity to serve the operating rate of the expanded plant, installing an oversize crushing plant, and including grinding equipment rated for 1800 bbl. production. The latter step would be encouraged by a situation under which the power supply would be limited, and thus dictate short grinding schedules during off-peak hours. As the market for cement developed, the plant could be enlarged, and full production would be possible based on expected growth of central power station facilities.

In Latin America, cement plants of 100-150 tons capacity probably will be built in unsettled regions where potential future development is indicated. Possibilities in this connection appear to lie in the northern sections of Mexico and Argentina, in Central America, central and northern Chile, possibly Ecuador and Bolivia. The dry process would predominate in those areas due to the scarcity of water, and the great distance from large central stations would encourage the establishment of a private power plant involving Diesel engines.

It might be supposed that, as labor in these sparsely settled regions would

be largely unskilled, plant design should involve a low degree of mechanization, instrumentation and automatic devices. However, this apparent handicap has been successfully overcome in several instances where the use of power shovels, traveling cranes, pneumatic transport systems, and other modern elements have proven entirely practicable. Labor recruited from local agriculture has been trained to become fairly skilled and reliable machine operators, kiln attendants, and maintenance workers.

Most of the dry process plants in Latin America employing comparatively short kilns were built approximately 20 years ago when the dry process was predominant in the United States. Many old dry process plants in this country have been replaced by more modern equipment which was removed and converted to the wet process in Latin America. There the latest techniques of making cement are being adopted but at a slower pace.

Many small dry process plants are now in operation there, and several have been built during the past five or six years with second-hand equipment acquired from plants in this country which recent developments in manufacturing methods and specifications had rendered obsolescent.

The quality of the single product obtained in these relocated plants meets official specifications which are not as stringent thus far as those existing in the United States in most instances. It is generally recognized, however, that intensifying competition among Latin American cement plants, if not future government specifications, will create the need for manufacturing facilities inherently capable of producing a variety of high quality Portland cements.

It is difficult to determine the initial rating of the 62 existing cement plants in Latin America, since the majority have been expanded one or more times. An inspection of recent data discloses that there are 19 plants with a rated capacity between 200 and 250 metric tons. Of those, ten plants are dry process and nine plants operate by the wet method. Most of the wet plants are located in Brazil, Colombia and Venezuela, while the majority of the dry plants are in Argentina, Chile, and Mexico. This does not include an important 250-metric-ton dry process extension now under construction in Mexico. The majority of Mexican plants have been constructed with second-hand machinery, including short kilns and rotary coolers, and open circuit grinding systems.

There are two 200-ton dry process cement-making units in Argentina, built between 1937 and 1939, which utilize long efficient dry process kilns and air-quenching clinker coolers. One of those units was included in a completely new efficient dry process plant. This plant includes an elaborate automatic blending system, pneumatic transport system, an overhead bucket crane operating in a large storage building, drying and grinding operations combined and conducted in the raw grinding mill, and a Diesel power plant. The power house and transformers are located close to the grinding department, thus economizing low-voltage cables.

For new Latin American plants of 300-400-metric tons daily capacity and over, the trend is definitely toward the wet process and the magnitude of such projects will warrant the installation of the latest apparatus and techniques as employed in the United States for manufacturing several types of cement. In this connection, raw materials processing may involve hydrometallurgical items; i.e., rake and bowl classifiers, hydro-separators, thicken-

FIG. 5

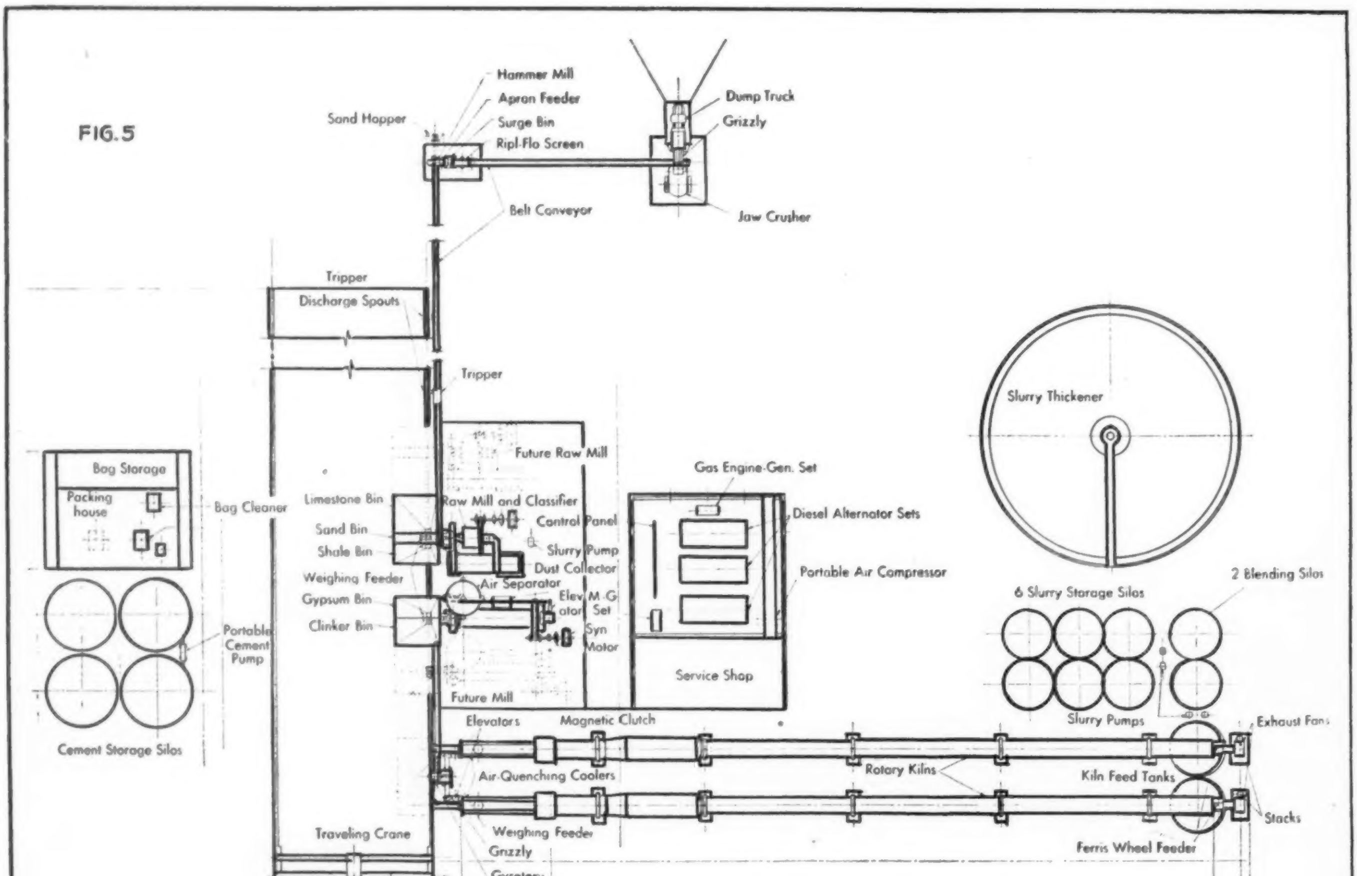


Fig 5: General arrangement of a Panama cement plant

ers, agitators, flotation equipment and other accessory items used in the treatment of cement raw mixtures when extremely accurate control of particle size and chemical composition is desired, and when, owing to the nature of the available raw materials, beneficiation by flotation is necessary. Of incidental interest is the possibility of applying heavy-density media separation sink-float process to eliminate the fraction that contaminates an otherwise suitable raw material.

That the trend in Latin America is toward highly efficient design for new plants, wherein the arrangement is not confined or hindered by existing units with which it is necessary to effect combination, is confirmed by the fact that two new 300-ton plants, as well as one 300-ton extension, involving the latest wet process equipment and circuits, are currently in process of construction in Colombia and Panama. The 300-ton plant extension will operate in conjunction with an existing 200-ton unit at Cali, Colombia.

The general arrangement of the Panama cement plant shown in Fig. 5 to which the two other units mentioned are similar, exemplifies a most efficient arrangement of machinery in the crossed "T" or "H" design which characterizes many modern wet process cement plants.

The 300-ton, or 1800-bbl., Panama plant arrangement lends itself readily to expansion to 600 tons capacity, at which figure it approaches closely the average ratings of cement plants in the United States. This compact plant of 300-tons rating is a prototype of the plant design that should figure prominently in programs for modernizing Latin America's cement industry and placing it on a footing to cope with the requirements of tomorrow's markets.

There are four plants in Latin America having a productional output of approximately 1000 metric tons or 6000 bbl. per day. Two of these are in Argentina, one in Brazil and one in Chile. Those four exceptionally large plants are all located within 50 to 125 miles distance of the principal centers of industry, commercial activity and population in the respective countries; that is, the plants are close to Buenos Aires, Rio De Janiero and Santiago.

The largest cement plant in Mexico has a capacity of 700 metric tons, or 4200 bbl., per day and is situated on the outskirts of Mexico City. One of the cement-making units in this plant is a modern 300-ft. dry process kiln with an enlarged calcining zone and air-quenching clinker cooler. Waste heat drying of raw materials in conjunction with this kiln supplements the heat recuperating function of the air-quenching clinker cooler and makes for high thermal efficiency.

EDITOR'S NOTE: Part 2 of article on Latin American cement plants will discuss trends in design and equipment.

Abandons Basing Point System

UNIVERSAL ATLAS CEMENT CO., New York, has abandoned its basing point system of making prices after forty years, Blaine S. Smith, president, announced recently, stating that prices f.o.b. the shipping point now are effective. Other cement companies in the area said the new policy came as a surprise as during a canvass of the leading cement firms, no others were found whose policies were being changed to f.o.b. pricing methods.

In announcing the change, Mr. Smith said: "This step is made necessary by the recent decision of the United States Supreme Court sustaining a Cease and Desist Order of the Federal Trade Commission against Universal Atlas and 73 other members of the cement industry." It is expected that other cement companies will soon change to f.o.b. pricing methods also.

Walls from Spray Gun

PYROC, a new building material that is sprayed on wire mesh to make walls and ceilings up to 8-in. thick, has been developed by C & T Painters, Ltd., London, England. The material adheres to wood or metal, and is said to be fireproof and non-cracking.

Pyroc is a mixture of lime, cement and vermiculite, and when sprayed, sets hard in 50 min., but will take nails or screws and can be cut by an ordinary saw. The material is normally absorbent, preventing condensation or sweating on interior walls, although it can be made waterproof for exterior work, according to the company.

In addition Pyroc is said to have low heat conductivity. In tests, a 1-in. thickness becomes only hand warm when heated by blow torch, and 3-in. is considered effective fireproofing for structural steel in buildings.

Cement Production in India

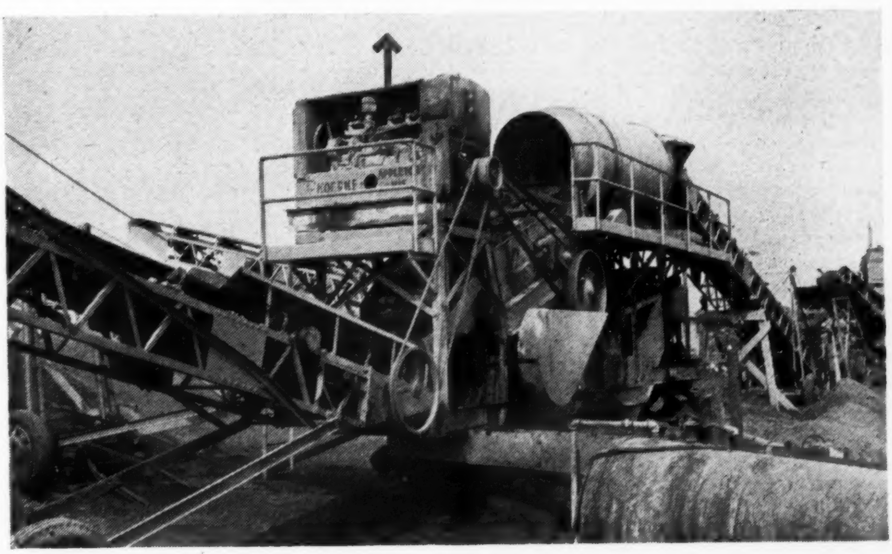
CEMENT PRODUCTION in India rose from a prewar 1,512,000 long tons in the fiscal year ended March 31, 1939, to 2,075,340 tons for the same period in 1946. Estimates for the fiscal year 1947-48, with a capacity of 3,209,000 tons against a demand of more than 3,500,000, call for a total cement-manufacturing capacity of 5,667,000 tons by 1952, sufficient for the requirements of public works, utility needs, roads, and general construction, according to an article appearing in *Mineral Trade Notes.*

Gypsum Standards

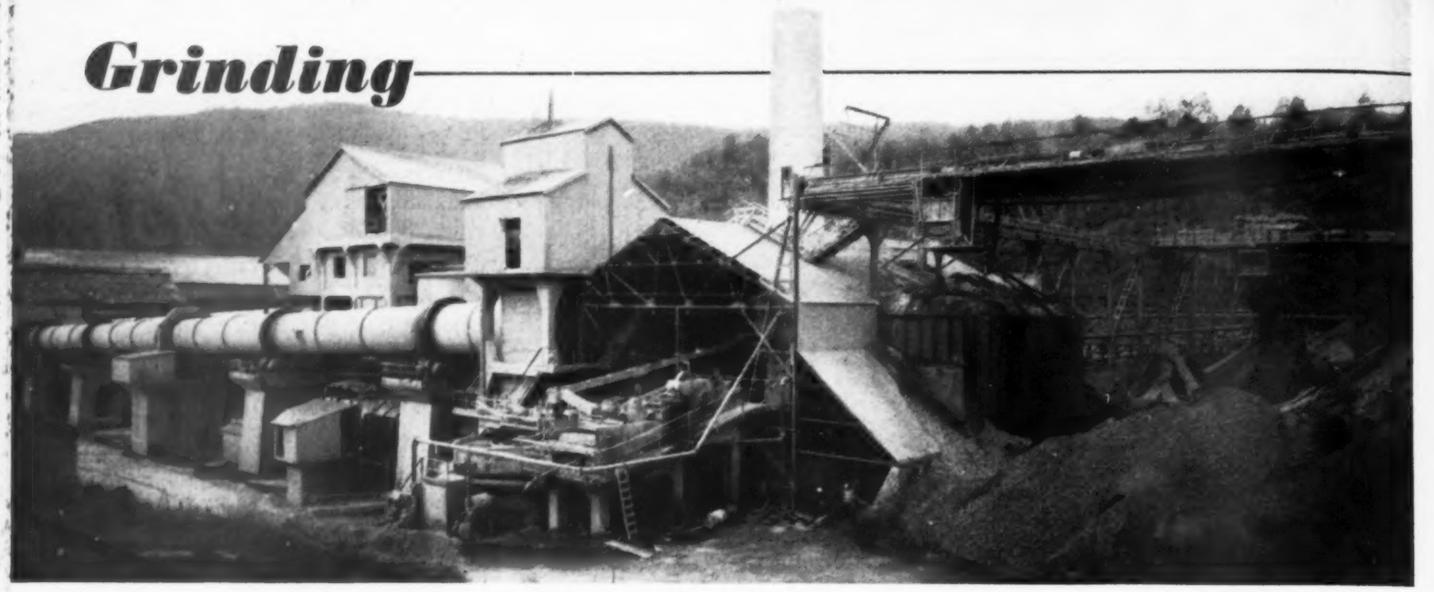
COMMITTEE C-11 on Gypsum, American Society for Testing Materials, plans consideration of the need for a specification on artificial or synthetic gypsum. Action on standards included recommendations for discontinuing the specifications for gypsum pottery plaster and calcined gypsum for dental plasters, while a tentative revision has been recommended in the Specifications for Gypsum Plaster which would change the strength requirements from tensile to dry compressive on 2-in. cubes.

Vermiculite Film

ZONOLITE CO., Chicago, Ill., has announced completion of a new 16 mm. industrial sound film, "Zonolite, the Wonder Material," which presents the history and detailed applications of vermiculite.



Washing, screening unit of Koepke Sand & Gravel Co., Hawkins, Wis. Note Caterpillar Diesel D8800 engine powering washer, vibrating screen and conveyor, foreground. This plant, made up entirely of portable units, has an hourly capacity of 120 tons



General view of plant with raw material storage piles to the right. One of the raw grind mills can be seen below the classifiers, to the right

Multiple Mills for Raw and Finish Grinding

Calaveras Cement Co., San Andreas, Calif., adds new 360-ft. kiln, 5-cu. yd. electric shovel, and uses 40-ton trucks in quarry

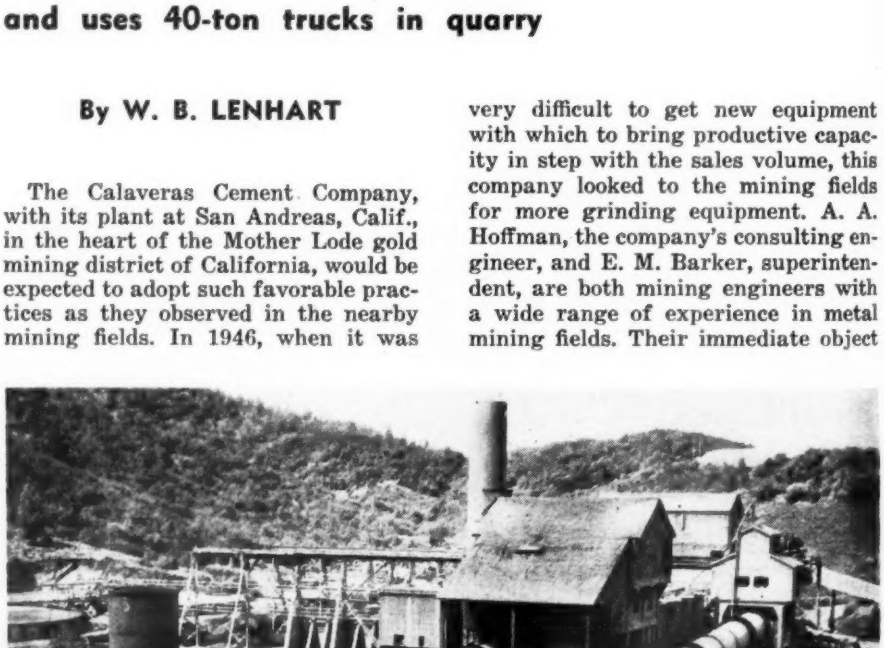
By W. B. LENHART

Much of our present day wet, closed-circuit grinding was first used and developed in the metal mining plants in the West. When the advantages of the method were demonstrated to the cement and other rock products industries, it was quickly adopted so that today in the cement industry closed-circuit grinding is common practice. The principle has been extended in the rock industries to dry grinding with separators returning the oversize to the grinding units.

Follow Mining Grinding Practice

One practice that seems to still be in favor in the mining field is the use of relatively small grinding units as compared to the larger mills found in the cement industry. A multiplicity of units simply means that one can be shut down for repairs and the total production of the plant will not suffer greatly. In some of the larger copper operations, ball mills are used in large numbers and one or several of these units can be considered as a "spare" and be thrown into service when an operated mill is down for repairs. These mills usually operate in closed circuit with heavy circulating loads, and as a general rule the finished product is not nearly as fine as in the cement industries. However, the rugged construction and general overall reliability of these smaller grinding units coupled with their output per horsepower lend themselves in an ideal manner as preliminary grinders both for raw and finish grinding.

The Calaveras Cement Company, with its plant at San Andreas, Calif., in the heart of the Mother Lode gold mining district of California, would be expected to adopt such favorable practices as they observed in the nearby mining fields. In 1946, when it was very difficult to get new equipment with which to bring productive capacity in step with the sales volume, this company looked to the mining fields for more grinding equipment. A. A. Hoffman, the company's consulting engineer, and E. M. Barker, superintendent, are both mining engineers with a wide range of experience in metal mining fields. Their immediate object



Latest kiln installation is the longest unit to the right

was to increase the grinding capacity in the raw end of the operation but no new mills were available within a year to 18 months. The plant is wet process.

The now famous "Gold Order" of the early 40's had shut down all the gold camps of the West so one of their first pieces of grinding equipment, a Marcy "87" (8-ft. diameter by 7-ft. long) was secured from the old Mary Mine at Silverpeak, Nev., one of the gold producers of E. L. Cord, the erstwhile automobile manufacturer. A second Marcy "86" (8-ft. diameter by 6-ft. long) was secured from the abandoned Walker copper mine in Plumas County, Calif. These two mills were installed in the raw grinding section ahead of the two 7- x 8- x 26-ft. Allis-Chalmers two-compartment tube mills. In this department there are two separate and complete grinding flow systems both alike. The Marcy mill receives its feed through drum type feeders. (¾-in. material—see screen analysis of feed which follows later). The pulp from the Marcy is elevated by belt bucket elevator to a duplex Dorr classifier with 42-in. rakes. The duplex classifier was installed at the time the first Marcy went in, and it is referred to as the "Bobtail" classifier to distinguish it from the bowl classifier. The coarser rake product passes to the first compartment of the Allis-Chalmers tube mill. Overflow from the duplex classifier goes to the older Dorr bowl classifier. The rake portion of the bowl goes to the second compartment of the Allis-Chalmers tube mill, the pulp from the first compartment of the tube mill going to the duplex rake classifier. The pulp from the second compartment of the tube mill goes to the rake section of the bowl classifier. The overflow of the bowl classifier is pumped to the thickener ahead of the kilns. The Marcy mills are trunnion discharge type. Each is driven by 250-hp. motors direct-connected. Thus it will be seen that the Marcys act as preliminators and operate in open circuit. The two compartment mills operate in closed circuit with the two Dorr classifiers (the "Bobtail" and the bowl). The two-compartment Allis-Chalmers mills are end-fed and discharge through ports in the periphery of the drum. A plate divides the mill so that the pulps from the two end sections can be kept separate. The mills are 26 ft. long, and 3 ft. of this length is used up in this discharge and constriction plate section so the company has plans to take out the grids and dividing plate and make them one compartment mills. These changes are expected to increase the production in the raw end to about 7000 bbls. per day. The larger ball mills are driven by 500-hp. Allis-Chalmers synchronous motors, direct-connected. The first Marcy mill went in service in February of 1947, the second went into service in May of the same year. The mills carry a load of 12 to 15 tons of American Forge Co. steel balls with graduated sizes from 4½-in. to 2-in. The manganese steel liners are of Mine and Smelter Supply Co. design but were made by American Manganese Steel Co. The mills have not been in service long enough to give any accurate figures on ball and liner consumption, but the mills still use the original liners and ball wear is nominal. Ball load in the mill is kept constant by daily feeding in a required number of the larger diameter balls.

Haulage units which quarry 40 tons from quarry to plant

How Mills Operate In Closed Circuit

The Marcy ball mill is essentially a mill of relatively short length compared to its diameter, and was one of the first to employ a low pulp line with a grid and lifters at the discharge end. It is said to be especially efficient when used in closed circuit with a classifier where heavy circulating loads are maintained.

It was decided in May, 1947, to use these mills as preliminators in the finish end, and the third "86" went into service. Still later, in December, 1947, the fourth "86" went on the production line, thus giving the company a total of four of these mills. The mills are manufactured by the Mine and Smelter Supply Co., of Denver.

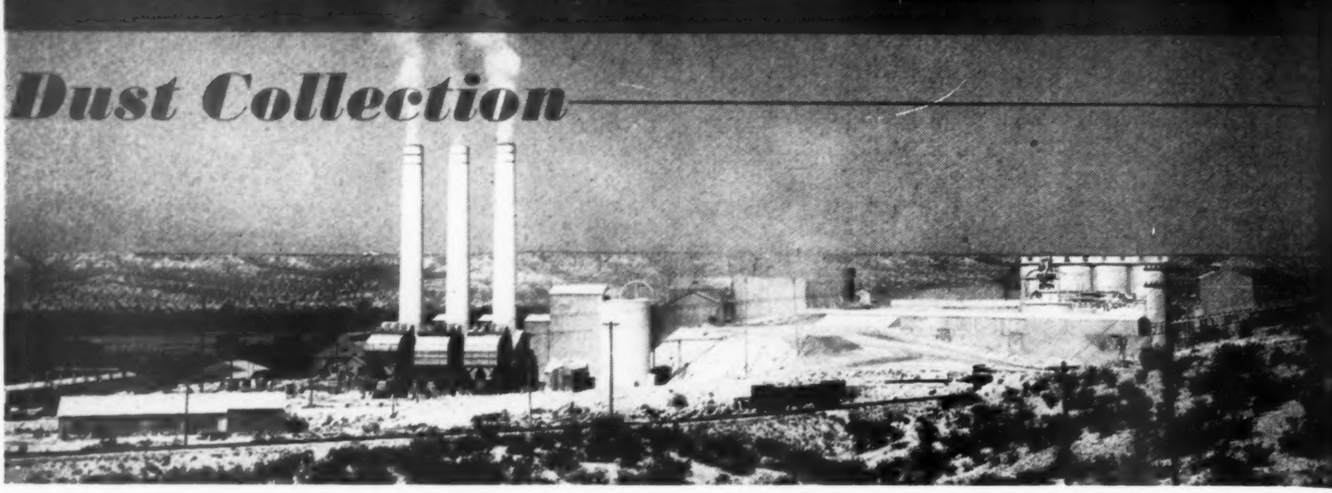
On the finish side there are three 8- x 26-ft., Allis-Chalmers, two-compartment tube mills each driven by 650-hp., Allis-Chalmers, synchronous motors. These three mills will be referred to as "A", "B" and "C". The clinker for one of the Marcy preliminators is fed to a short, cross conveyor by a Hardinge "Feedometer", and the material then passes to a Syntron, electrically vibrated, heavy-duty feeder that moves the clinker through the feed end trunnion on the Marcy mill. Experiments are in progress to use the head motion of a Wilfley concentrating table in an effort to deliver a heavier load into the mill. The ground clinker from the preliminator goes to a bucket elevator and then passes to the two-compartment, Allis-Chalmers mill "A". This mill discharges to a pump serving an air-separator, and the oversize is chuted to mill "C". In a similar manner, the second Marcy mill discharges to the mill "B" which in turn is served by its separator and the oversize from the second separator passed to mill "C". Mill "C" thus gets its feed from the two Sturtevant separators (10- and 14-ft.) but it operates in closed circuit with a 16-ft. separator. Its product is pumped to the finish silos by Fuller-Kinyon pumps. All five of the grinding units in this section are air swept to a more or less degree as each is supplied with a relatively small fan at the discharge end. The finer portions are therefore taken off and passed to a bank of 12 bag-type Allis-Chalmers filters, and the material is transported by a small diameter screw conveyor for final disposal. Mills "A" and "B" products are pumped to the separators by individual Fuller-Kinyon pumps. Mill "A" has the smaller collector.

Gypsum is at present fed to the finish mills by a screw-type feeder but these are shortly to be replaced by Hardinge constant weight feeders.

On the finish end, the Marcy mills have a capacity of 180 bbls. per hr. The clinker is of fairly uniform size and evenly sized. The mill's discharge has a surface area of 300. The discharge from the Allis-Chalmers, two-compartment mills has a surface area of 1200, and the cement sent to the silos has a surface area of 1700.

On the raw side, the Marcy mills have a capacity of 50 t.p.h. each

(Continued on page 172)



General view of plant with kiln stacks to the left, each equipped with multiclone and electrical precipitator type dust collectors and to the right may be seen storage silo

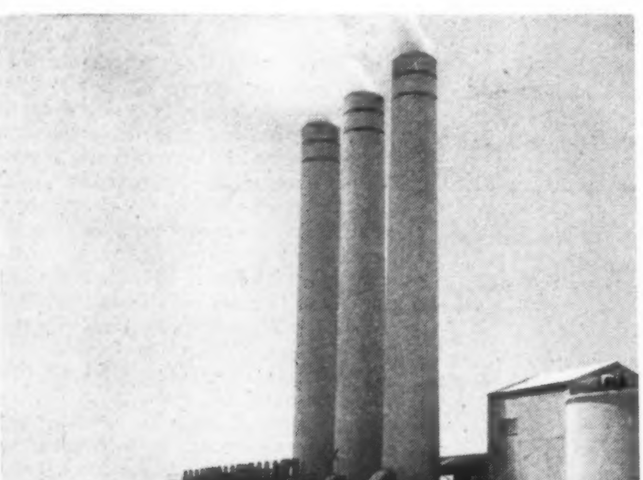
World's Longest Dry-Process Kilns

Riverside Cement Co., completely rebuilds Oro Grande plant without stopping production of cement

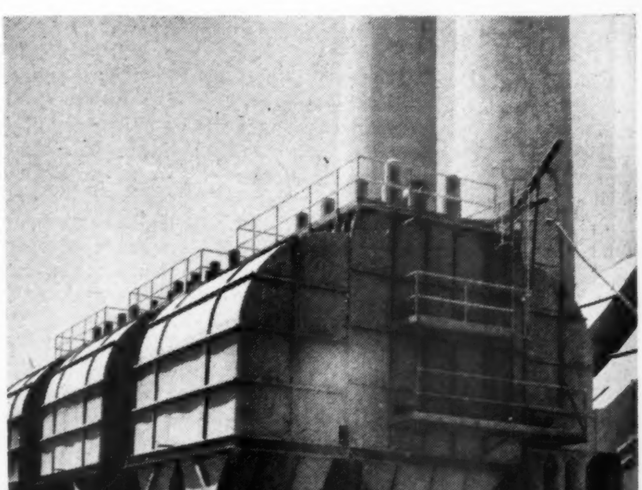
COMPLETELY MODERNIZING a plant while operations are under way has been accomplished by Riverside Cement Company at its Oro Grande plant in spite of the handicap. Two plants are operated by the Company in southern California. The older, and better-known plant, is at Crestmore, California, near the city of Riverside and in the heart of the citrus fruit growing industry. The second plant is at Oro Grande, a short distance from Victorville, on the edge of the desert areas. This plant is on the main line of the Union Pacific and the Santa Fe railroads, and it is also on Highway 66, one of the main transcontinental highways spanning the country. Water and labor are available in the area as well as electric power from Hoover Dam near Las Vegas. Oro Grande is located within easy shipping distance to the industrial areas of southern California.

In the late twenties the older and original plant at Oro Grande was shut down, but in 1942 operations were resumed. About the same time a rebuilding program was started that consisted essentially in condemning all the older equipment and replacing it with new, modern and very efficient equipment. However, the change-over was carried out in such a manner that the old portions of the plant continued to produce until the new sections were in operation. At this writing a major portion of this fine plant has been changed over to the new equipment, but much work is still in prospect.

We wish here to express our appre-



General view of tamden installation of multiclone and electrical precipitator dust collectors at stack end

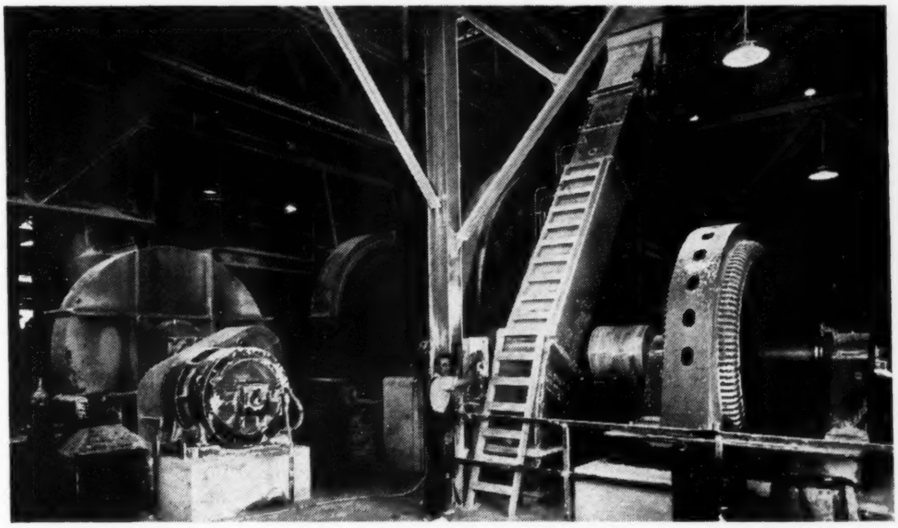


Close-up of dust collecting assembly showing the compact arrangement for this dual installation

ciation for permission to visit this plant to Warren H. Leonard, vice-president and general manager, and to Lester C. Small, assistant general manager, for courtesies extended, as well as to John M. Sauer, chief chemist, and R. H. Wightman, superintendent.

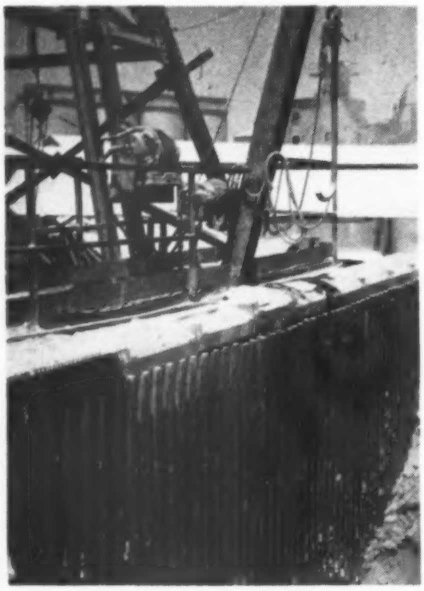
New Dry-Process Kilns

One of the principal features of the new plant is the new dry-process kilns. Three have been installed and are now operating. Each is 10 ft. in diameter and 350 ft. long. These kilns are the longest dry-process cement kilns in the world. They were designed by F. L. Smidth & Co., and are of all-welded construction. At present each of these kilns is producing about 2200 bbl. of clinker per day at a fuel consumption of approximately 1,000,000 B.t.u. per bbl. Each kiln rides on five tires and is rotated by a 100-hp. d.c. motor through a Philadelphia gear reduction unit. For standby purposes in the event of electrical power failures there are International gas engine units capable of rotating the kilns slowly. The main d.c. drive motors are operated by individual motor generator sets, which also furnish power to the d.c. drive motors on the kiln feeders. Associated with each kiln is a 5- x 20-ft. Fuller recuperator. The kiln lining is 6 in. thick throughout. In the burning zone the brick are 70% alumina; the remainder is 40% and 50% alumina. No insulation is used. The control station for each kiln includes the following control and recording instruments: Bailey oxygen analyzer; Brown optical pyrometer; Brown draft controller; Brown temperature recorder, which produces a record of the temperature of gases leaving the kiln; Hood draft indicator; revolution counters and wattmeters for kiln and feeder. A steel frame structure enclosed by corrugated steel protects the firing end of the kilns. The ends of this structure are open, which keeps the kiln room cooler. Bunker C oil is used for fuel. It is delivered to the



One of the two 10-x 16-ft. raw grinding mills, each of which is operated in closed circuit with air separators

Two "pressurized" steel storage silos which serve to thoroughly mix the raw ground materials. Air pressure moves the aerated materials through pipes to the kiln feed silos ahead of the kilns



Hopper at primary crusher has one side constructed of steel rails with the web facing the point of impact from material dumped from quarry trucks

Coen oil burners at a pressure of 350 p.s.i. These burners and the high oil pressure permit the use of a very small amount of primary air which is at a pressure of twelve inches water. Present kiln speed is 60 revolutions per hour and is kept constant. The firing rate is varied as needed. Hot secondary air is received from the Fuller recuperators. Clinker leaves the recuperators and discharges to two 40-in. skipulters, and these in turn feed a Stephens-Adamson pivoted bucket conveyor that discharges the clinker to open storage. A new 70-ft. P & H crane spans this open storage. This crane has been arranged so that the bucket can deliver clinker to a steel bin from which railroad cars can be loaded, for at times it is desirable to send clinker to other grinding plants. Five old kilns, 10- x 8- x 125-ft., remain operative. Additional raw grinding capacity now being installed will permit operation of the old kilns as well as the new kilns and give a total plant capacity of about 3,500,000 bbl. cement per year.

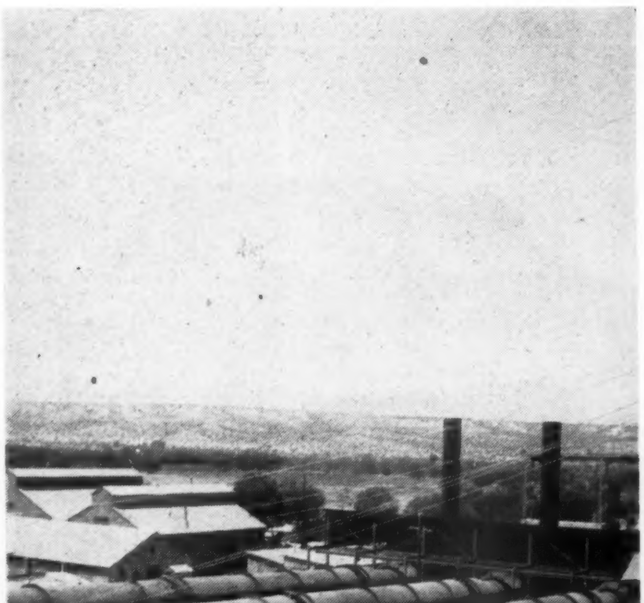
Dust Collection

Each of the new kilns has its individual draft fan and is equipped with tandem dust collectors. These dust collectors are of interest in that about 79 percent of the dust is collected in Multiclones and the remainder is collected in electrostatic dust precipitators. The gases finally pass into high stacks, one for each kiln. The question has been asked why such extensive dust collection equipment is needed at a plant located in the desert section of California. The Riverside officials state that it is not only their desire to have a clean and efficient new plant but also they feel very definitely that the collected dust is worth enough to pay for the entire cost of dust collectors within three or four years.

Aeration Silos

Another feature of this modern plant is the use of aeration silos. Their function is to produce a thorough blend of the ingredients of the raw mix. At present there are five raw storage silos, two of which are aeration silos. Plans call for the construction of several more areation silos not only to permit thorough blending but also very accurate correction of mix compositions. The present aeration silos are built of steel and are approximately 40 ft. in diameter and 50 ft. high. They are of welded steel-plate construction with no cross reinforcements inside the silos. Each silo is supported on a heavy reinforced concrete slab with the silo cemented and anchored in this base. In the bottom of each silo are porous plates grouted into wind boxes. Through these porous plates low pressure air is introduced in such a way as to mix the dry pulverized contents of the tank. Samples can be taken from the silos from time to time, thus insuring a uniform and constant feed material for the kilns. By agitating and mixing the materials

Showing feed end of 350-ft. dry process kilns



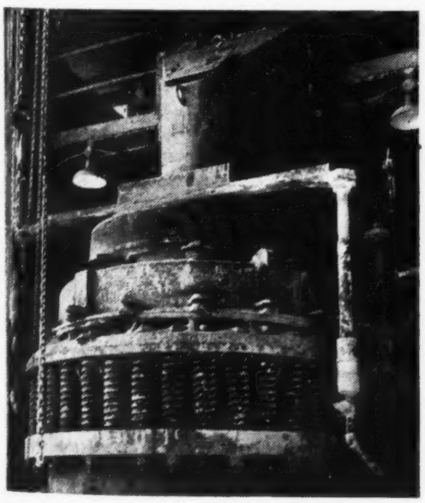
Looking toward firing end of three 10- x 350-ft. kilns

Dual body side-dump trucks of 38-cu. yd. capacity powered by 200-hp. Diesel engine used for quarry haulage

in the silos in this manner, the advantages of the wet process become available to dry process plants. When the raw material in an aeration silo has been mixed and the silo is ready for emptying, a single outlet is opened and the fluidized contents flow out steadily to a jet conveyor. This conveying system, which is a development of the company engineers, has no moving parts, is economical of air, and rapidly conveys the material through a pipe line 800 ft. long, terminating at the kiln feed silo. Air for the silos, and for other purposes about the plant, is obtained from a battery of four new Ingersoll-Rand compressors comprising two PRE-1 and two PRE-2 two-stage units. For the Fuller-Kinyon pumps in the plant, Fuller rotary compressors are used. Low pressure air for the aeration silos is dehydrated by passing it through an after-cooler.

Finish Mill Improvements

In the finish end of the new plant considerable work yet remains to be completed, and at time of inspection a 10- x 10-ft. Marcy ball mill, a 9½- x 18-ft. F. L. Smidth Tirax ball mill as well as two older 7- x 30-ft. tube mills were being used. The latter two units operate in closed circuit with two 14-ft. Sturtevant separators. Two new 7- x 30-ft. Allis-Chalmers tube mills, fabricated by the Moore Dry Dock Company of Oakland, California, are now being installed. These two new tube mills will operate with two 16-ft. Sturtevant separators. The use of a Marcy mill in the cement industry is rather new for most of these grinding units have found service in the metal mining industry of the West.

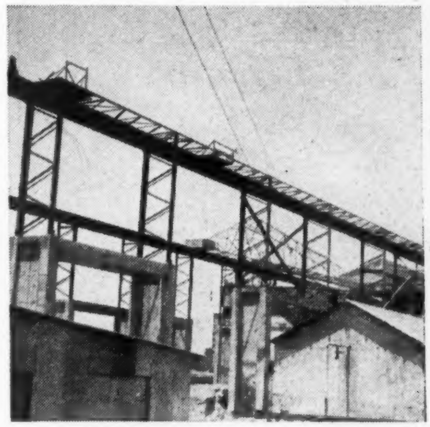


A 5 ½-ft. cone crusher reduces the jaw crusher product

The finished material is delivered by an 8-in. Fuller-Kinyon pump to one of four 13,000-bbl. capacity bins. In the packhouse, which is above the railroad track, a new four-spout Modern packer is installed. Filled sacks are received by a belt conveyor that can be raised or lowered vertically at its outboard end, and it can function to load cars at the lower horizon, or load trucks at a slightly higher elevation. Skirt boards on *top* of the conveyor permit the filled bags to pass under these boards, but at the same time prevent them from rolling. The new plant has a capacity of 2,400,000 bbl. of cement annually all of which is marketed under the company's trade name of "Bear Brand."

Crushing and Raw Grinding Additions

On the raw side of the new plant, the older equipment has been entirely replaced with modern and efficient units starting from the 48- x 60-in. Allis-Chalmers primary jaw crusher to the aeration silos ahead of the kilns. The new jaw crusher is installed in a pit with trucks from the quarry side-dumping to a hopper from which rock is fed to the crusher by a heavy-duty Jeffrey vibrating feeder. The crushed material discharges to a horizontal belt conveyor serving a Symons vibrating screen over a new 5½-ft. Symons cone crusher. Product from the cone crusher is moved by bucket elevator and a belt conveyor to storage. Crushed rock reclaimed from storage by belt conveyor is conveyed to two 4-ft. short head Symons cone crushers that operate in closed circuit with two Symons vibrating screens, the fines going to surge bins. Clay and limestone are processed in this same unit at different times. The finished crushed material is in the two 80-ton surge bins, one for limerock and one for the clay, and is fed to two 9½- x 18-ft. F. L. Smidth ball mills through Jeffrey weighing feeders, one for control of the clay and one for the limestone. The two F. L. Smidth 9½ x 18 Tirax raw grind mills operate in closed circuit with seperators. One of the mills uses a separator that is company designed and the other uses a 16-ft. Sturtevant unit. The two raw grinding mills are driven by individual



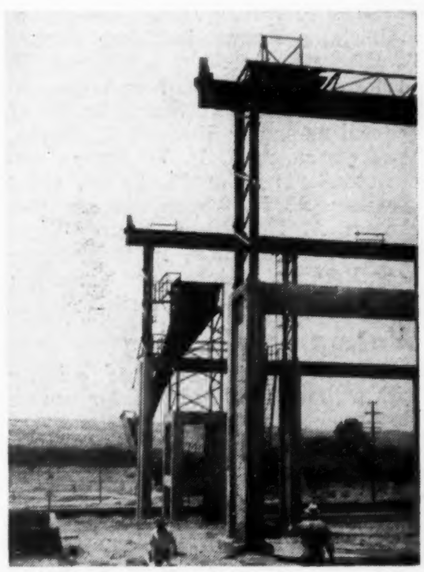
Overhead traveling crane structure with 70-ft. span is equipped with clamshell for handling clinker in storage

800-hp. Electric Machinery Company synchronous motors that operate on 2300-volt current. The finished ground raw mix is conveyed by two 8-in. Fuller-Kinyon pumps to the previously mentioned aeration silos.

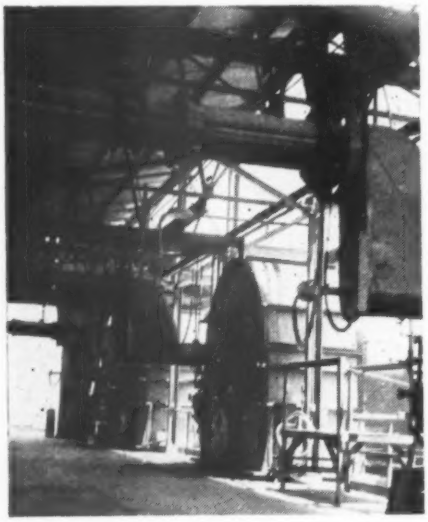
From the aeration silos raw material moves to the kiln feed silo. Raw material is fed from the silo to a screw conveyor that extends over the feed end of the kilns. This longer conveyor discharges to three shorter cross-conveyors (one for each kiln) and any excess in the first conveyor is carried on to a surge bin and the material returned to the feed system. There is a variable speed motor on the main screw.

Quarry

In the quarry are two 2½-cu. yd. Marion electric (No. 492) and a 2-cu. yd. Marion diesel rig, which load a fleet of four split-bed, side-dump Autocar trucks that haul 38 tons per load to the primary crusher, a down-hill haul of about 2½ miles on an oiled road. The trucks are each powered by



Crane spanning the clinker storage can dump to the steel hopper from which cars can be loaded



Firing end of three 350-ft. kilns showing oil burner piping and controls

200-hp. Cummins diesel engines.

The quarry has been opened up on several 25-ft. benches with all benches easily accessible. Ingersoll-Rand wagon drills are used with drilling confined to down holes. Apache powder is used for blasting. Bag powder is used in the down holes. No delays are used in the blasting.

Shale is secured from a deposit between the rock quarry and the plant. This material contains just about the right amount of silica, some of which is in the form of boulders. Shale is run through the crushing plant one day and stone the next or as needed.

The 38-ton dump trucks on arriving at the crusher side-dump to a vertical pit that is approximately 12 ft. wide, 20 ft. deep and 25 ft. long. The side receiving the impact of the rock is made up of vertically mounted, 75-lb. steel rails that are placed web to web. It means a very serviceable buffer. The rock from the quarry tends to break blocky. It is a high calcium stone of uniform grade.

Official personnel includes: Garner A. Beckett, president; Warren H. Leonard, vice-president and general manager; Lester C. Smull, assistant general manager; Howard R. Starke, chief engineer; R. H. Wightman, superintendent; John M. Sauer, chief chemist; A. H. Logan, master mechanic; A. H. Wilson, quarry foreman; J. B. Morgan, mill foreman; Lew Breault, maintenance foreman; and D. W. Yates, chief clerk.

Waterproof Coating

KAYWHITE, an inorganic coating with a lime base, designed for use on fibro-cement products, portland cement products, concrete, stone, brick and wood, has been announced by Kraus Research Laboratories, Sparks, Md. The product is applied with brush or spray gun and when dry to touch is covered with a Top Dressing which immediately renders Kaywhite insoluble in water and starts it on its way to stony hardness.

Cement Companies Adopting New Pricing Methods

UNIVERSAL ATLAS CEMENT CO., U. S. Steel subsidiary, was the first manufacturer of portland cement to abandon the multiple-basing point delivered price system, on July 7, two days before the effective date for the ruling of the Supreme Court that that system of pricing was illegal. The company has adopted a system of selling cement at prices f.o.b. the shipping point or, if the customer so desires, at delivered prices which reflect full transportation charges from shipping point to destination.

Under the selling method heretofore used, Universal Atlas like other companies in the industry, has frequently assumed a part of transportation cost from shipping point to destination in order to meet prices of competitors located closer to customers. While discontinuing that practice, the company believes that that method of pricing represented the fairest, most practical and most non-discriminatory method of marketing cement; that it gave consumers the benefits of competition between different producers. The decision to quit practices that are believed sound and fair to customers was made because the company believes the law as interpreted by the U. S. Supreme Court should be respected.

PENNSYLVANIA-DIXIE CEMENT CO., a second multiple-plant producer, has since announced similar price plans. Penn-Dixie will sell only at wholesale, for rail shipment, in full carload lots, in bulk, paper or cloth. A quarterly pricing policy has also been announced, whereby the current prices, for instance, are guaranteed against advance for the balance of the quarter ending September 30, 1948. Increases in freight rates, taxes on freight rates and taxes on sales are not included in the guarantee.

Other cement manufacturers have announced that similar practices will be adopted while still others anticipate continuing practices that have been in effect and which they maintain constitute competitive selling. It is still too early to indicate practices to be followed by the majority but it appears that most companies will sell f.o.b. mill plus transportation charges to destination.

Effect on Users

The cement industry decision is undergoing intensive study by all heavy commodity industries. U. S. Steel Corp., for example, has decided to abandon basing point pricing as a result of the court ruling. An industry-wide move in other industries may be underway. The new system of pricing certainly increases profit expectations in all industries in which large backlogs exist. The impact will be on the purchaser.

The effect of the court ruling and the shortage of the supply of cement, in general, on some consumers is clear from the following letter which ALBUQUERQUE GRAVEL PRODUCTS CO., Albuquerque, New Mexico, sent its customers under date of July 2:

"The Supreme Court of the United States has upheld the Federal Trade Commission's contention that it is illegal for our cement suppliers to absorb any portion of the freight charges on cement shipments, and thereby requires them to sell strictly on a f.o.b. mill basis. As a brief explanation of this action, we quote as follows from our notification from our main suppliers of cement:

"'On April 26, 1948, the Supreme Court of the United States upheld by a 6 to 1 decision the Cease and Desist Order of the Federal Trade Commission directed against practically all producers of portland cement in the country. This order was issued in 1943, after lengthy hearings which were started in 1937. In 1946 the Seventh Circuit Court of Appeals overruled the Federal Trade Commission, which then carried an appeal to the Supreme Court and won. Applications for a rehearing before the Supreme Court were denied on June 7, 1948. Therefore, our attorneys advise us that marketing policies of this company will have to be altered to conform with the Federal Trade Commission's order interpreted in the light of the Supreme Court decision on this case and others involving similar issues recently ruled upon.'

"The time for arguing the merits of the case has passed; the Supreme Court of the United States has ruled and, until Congressional action alters or clarifies the existing laws, the cement mills must comply with the Supreme Court's ruling as interpreted by their lawyers. Under this new marketing policy, Albuquerque is placed at a disadvantage due to the fact that there are no nearby cement mills, and the f.o.b. mill prices plus freight charges exceed the previous price of cement in this area by a very substantial amount.

"Accordingly, we are compelled to revise our price structures and are enclosing herewith our revised price lists. We would also like to call to your attention a change in our terms which now requires accounts to be paid by the 10th of the month in order to be eligible for cash discounts.

"We wish we could sound an optimistic note regarding the availability of cement, but we do not believe this change in marketing policy of

(Continued on page 182)

LEHIGH Modernizes For the Future

Dumping stone at primary crusher Sandts' Eddy plant

A CONSIDERABLE amount of cement plant modernization and expansion has been in progress during the past few years to increase capacity and improve efficiency. Despite the high cost of capital improvements, many cement companies have considered it prudent to invest large sums of money in new machinery and equipment. Among these more progressive cement manufacturers is the Lehigh Portland Cement Co.

The company had its beginning in 1897 when the original 200,000 bbl. per year plant was built at Ormrod, Penn. Today the company owns 14 plants in eleven different states with a combined annual capacity of 20,000,000 bbl. Although Lehigh's production was at one time concentrated largely in the Lehigh Valley, it has over the years decentralized its business, and now owns and operates plants at Ormrod, Fogelsville, and Sandt's Eddy in the Lehigh Valley; Alsen and Buffalo, N. Y.; Cleveland, Ohio; Union Bridge, Md.; Fordwick, Va.; Birmingham, Ala.; Mitchell, Ind.; Oglesby, Ill.; Mason City, Iowa; Iola, Kans.; Metaline Falls, Wash. Lehigh markets its products in 41 states of the Union.

Through the building of new plants and the acquisition of mills of other companies, Lehigh has slowly but steadily expanded its capacity and its area of distribution. The latest additions were the plants of the Great Lakes Portland Cement Corp. at Cleveland, Ohio and Buffalo, N. Y., the control of which was acquired through stock purchase in 1927 and the assets of which were merged with the Lehigh Company in 1941.

During the past few years the company has purchased extensive marl deposits in Minnesota not far from Minneapolis where it contemplates the construction of a new wet process plant sometime in the future. Last year the company purchased another prospective plant site near Flagler Beach, Fla. This property comprises 9500 acres of coquina shell deposits, said to be the largest in the country. To assure ample reserves of material, the company is retaining title to the 1800 acres of limestone and clay it acquired in 1926 near Ocala, Fla. Moreover, because of the possibilities for variations in types of cement, the company has in addition recently bought 1000 acres of kaolin deposits in Georgia, so that it will have three sources of argillaceous material for its new Florida venture. Since the plant at Flagler Beach will probably be built on the Florida Intracoastal Canal, which will afford cheap water transportation, the company has purchased a dock property on deep water along the St. Johns River at Jacksonville for the construction of cement silos and a packhouse. Lehigh also has large holdings of raw materials in other states which may in the future justify the construction of plants at other locations.

Since the War the company has spent approximately $6,000,000 for plant modernization and improvement. Its original program for 1948 contemplated the expenditure of $3,400,000 for capital improvements. However, because of the plans just approved for the doubling of the capacity for its Metaline Falls, Wash. plant, this figure has now been increased to approximately $5,500,000. To date this year capital investments have already reached the $1,500,000 mark.

Some of the more important improvements made by Lehigh during the past two or three years are outlined below plant by plant. However, at the outset it should be stated that large sums of money were spent in that period to convert Lehigh quarries from rail to truck haul in order to effect maximum flexibility and economy. Simultaneously new and larger excavating shovels, all of them powered by electricity or Diesel engines, were put into service. This conversion program has now been completed and is meeting full expectations.

Alsen, N. Y.

A new installation of facilities for the manufacture of masonry cement has been completed. An access concrete road has been built between the highway and the present concrete road at the plant. In the quarry a Marion Model 342 Diesel-powered shovel has gone into service, and four Diesel-powered Sterling trucks pulling 14-ton Easton Phoenix side-dump semi-trailers. Formerly, quarry cars were loaded direct by shovel and hauled by locomotive direct to the crusher. Trucks now dump directly into the crusher. Alsen is a dry process, waste heat plant with four 7½-ft. x 122-ft. rotary kilns.

Birmingham, Ala.

An additional tube mill in the clinker grinding department brings into balance capacities, to increase production as now needed by the additional load in grinding masonry and high early cements. A new and much enlarged change house was constructed. Wilfley slurry pumps and ferris wheel feeders are replacement installations. Formerly orifice feeders were used. In the quarry, five Autocar Diesel-powered trucks with Marion end-dump bodies of 10 tons capacity have replaced quarry cars. The latter were hauled in trains by locomotives from the shovel to the foot of an incline. Trucks now dump from a loading dock into skip cars at the foot of the incline. Birmingham is a wet process plant, with four 11-ft. 3-in. x 10-ft. x 190-ft. kilns.

Buffalo, N. Y.

This is the largest single unit of the company, a wet process plant, with four 11- x 250-ft. kilns and an annual capacity of 2,500,000 bbl. Chain systems have been installed on each of the kilns, principally to reduce gas temperatures in connection with the installation of electrical precipitators to collect stack dust. Improvements to the packing facilities have included metal belts for conveying packaged cement and the installation of feeders from the cement storage silos for more accurate control of flow. The existing change house for workers was altered and a new one built for the foremen. Equipment

New semi-trailer and shovel operating in Sandts Eddy quarry. Nearly all plants of Lehigh have new haulage and excavating equipment.

for the manufacture of mortar cement has been installed.

Cleveland, Ohio

This plant is one set up to grind clinker shipped in from Buffalo. Alterations have been made to the packhouse for bulk loading of cement including additional storage for resale of materials, the revamping of the present packing machinery installation for loading of box cars including a new 4-spout packer.

Fogelsville, Penn.

Installation of an 8-ft. 6-in. x 30-ft. compeb mill and auxiliary equipment in the clinker grinding department has added flexibility and more capacity. Grinding has been in open circuit through Griffin mills followed by tube mills in closed circuit with mechanical air separators. The new mill augments the existing setup and may function as a preliminary mill in open circuit, to produce more feed for the tube mills or may be operated as a finish mill closed circuited with the air separators. The quarry is unchanged but a Marion Model 331 crane has been added, for stripping and general utility work throughout the plant. This is a dry process plant with 10-ft. x 7-ft. 6-in. x 125-ft. rotary kilns.

Fordwick, Va.

A ventilating system and electrostatic dust collector has been installed in connection with the power house for the protection of sensitive electrical equipment from dust. With the new system, air is filtered and applied in the power house under slight pressure. In the quarry, a Bucyrus Model 54B Diesel-powered shovel has gone into service for stripping and for handling shale. Three gasoline-powered Autocar trucks with Marion end-dump bodies of ten tons capacity have augmented quarry cars that were hauled in trains by locomotives direct to the primary crusher. Trucks now load the trains at a loading dock.

Iola, Kans.

At this plant, which has had direct current electrical motors, emphasis has been on installation of power equipment and conversion to alternating current motors in some departments. The quarry was electrified and additional generating capacity was required to handle the increased load. A Nordberg dual-fuel (gas or oil) Diesel engine generator unit was installed. The unit is rated 1200 b.h.p., has a supercharger, and is direct-connected to an 840 kw. 60 cycle generator with a V-belt driven exciter. Alternating current motors have replaced direct current motors in the crushing plant, and a 500 kw. motor-generator set has been installed.

Other mill changes have included the re-arrangement of high early strength cement and mortar cement packing stations and installation of one new packing machine, and installation of two additional direct-firing unit coal pulverizers for two of the five kilns. Continually threatening shutoffs of the supply of natural gas made this installation desirable. A Bucyrus Model 54B electric shovel has gone into service for excavating shale, a P & H 1400 electric shovel in the limestone quarry, and a Marion 33M Diesel was purchased for work around and in the plant. Four Diesel-powered Mack trucks with Garwood side-dump bodies of 14 tons capacity now haul limestone to a heavy-duty feeder from which skip cars at the foot of an incline are fed for delivery to the crusher. Formerly, trains of quarry cars were hauled by locomotive to the incline. Shale is hauled direct to the hammermill. This plant is wet process and has four 8-ft. x 7-ft. 6-in. x 150-ft. and one 8-ft. x 160-ft. rotary kilns.

Mason City, Iowa

This is a wet process waste heat plant with four 9-ft. 6-in. x 9-ft. x 140-ft. rotary kilns. Principal mill additions have been ferris wheel feeders for feeding slurry to the filters and Hauck thawing pits for thawing coal cars. Two Marion Model 492 electric shovels were purchased for the limestone quarry and a Marion Model 33M Diesel shovel for the clay quarry and for general utility service around the plant. Five Autocar gasoline-powered trucks with ten-ton Marion end-dump bodies now dump from a loading dock into skip cars at the foot of an incline; where trains of quarry cars formerly were hauled by locomotive.

Metaline Falls, Wash.

A number of improvements have been completed at this mill and a new major program has recently been announced. An additional tube mill has been installed in the clinker grinding department and a jaw crusher to be used in connection with operation of quartzite deposits which constitute a new source of supply. A Bucyrus Model 54B electric shovel was recently delivered for excavating limestone. Three Mack gasoline-powered trucks with Marion end-dump bodies of seven tons capacity have displaced quarry cars for direct delivery to the primary crusher.

Equipment on order consists of a

10- x 350-ft. rotary kiln with Fuller inclined grate clinker cooler, and two 10- x 18-ft. Kennedy mills for grinding raw materials. The latter will be air-swept mills with auxiliary coal furnaces for drying while grinding, and will be in closed circuit with cyclone separators. Present kilns are two 9-ft. 6-in. x 9-ft. x 140-ft. units. The plant is dry process.

Mitchell, Ind.

Principal improvements at this plant have been in connection with power. An out-moded steam generating plant is being displaced and the plant completely electrified and converted to the use of purchased power. The shops, office and laboratory have been converted to use 60 cycle purchased power and a sub-station tower has been purchased. New excavating equipment comprises a Lima Model 1201 Diesel shovel, a Bucyrus Model 100B electric shovel and a Marion Model 492 electric machine. Five Autocar gasoline trucks with 10-ton Marion end-dump bodies now dump from a loading dock into skip cars at the foot of an incline. Formerly, locomotives hauled trains of quarry cars to the same incline. Mitchell is a dry process plant with ten 7-ft. 6-in. x 125-ft. rotary kilns.

Oglesby, Ill.

This is a dry process waste heat plant with six 7-ft. x 8-ft. x 136-ft. kilns and one 9-ft. x 7-ft. x 8-ft. x 138-ft. Small cyclone collectors have been installed between the kilns and unit pulverizers to remove clinker dust. A mortar cement packing machine has been added in the No. 2 packhouse. A Bucyrus Model 100B shovel has been installed in the limestone quarry and a P & H Model 1055 Diesel shovel for stripping. A Byers Model 83 crane has been added for general utility work. Five Mack gasoline-powered trucks with Gar Wood side-dump bodies, 14 tons capacity, have replaced quarry cars in delivering stone direct to the primary crusher. The trucks are used at times for stripping in connection with the Diesel shovel. Also six 15-cu. yd. Tournapuls and tractor have been added to the stripping operation.

Sandt's Eddy, Penn.

One of the major installations at this mill is a Koppers electrical precipitator to collect dust from the waste heat gases. The precipitator has recently gone into operation. Additional equipment to permit bulk loading at No. 2 packhouse has been installed and with it, changes in the cement transport line. A 6-in. Fuller-Kinyon line has replaced one of five inches from the finish mill to the silos and a new air compressor put in to supply the additional air required for operation.

The handling and storage of materials has been improved. Track has been acquired from the L & N. E. Railroad Co. for use as a siding to unload various incoming raw materials into the raw storage building. Simultaneously, the storage section has been extended to increase storage facilities for sand, pyrites and limestone. A roof was constructed over the crane runway to accommodate the coal storage area. Thawing pits equipped with Hauck burners were provided for thawing of frozen coal and stone in hoppered cars. Quarry operations have been simplified with the addition of five Mack gasoline-powered trucks with side-dump Easton Phoenix semitrailers of 15 tons capacity for direct haul to the primary crusher. Formerly, older truck equipment loaded trains at loading docks and locomotives hauled the stone to the crusher. A P & H 655B Diesel crane was added for yard service. This is a wet process waste heat plant with four 11- x 10- x 160-ft. rotary kilns.

Ormrod, Penn.

Postwar changes at this mill have been confined to the quarry where five gasoline-powered Mack trucks with end-dump Marion bodies of 7 tons capacity replaced quarry cars. Trucks dump from a loading dock into skip cars at the foot of the incline, where trains of quarry cars formerly served the skip cars. Ormrod is a dry process plant with ten 7-ft. 6-in. x 7-ft. x 92-ft. rotary kilns.

Union Bridge, Md.

At this plant, a new packhouse has just been completed. In addition equipment for the manufacture of mortar cement has been installed, and a ventilating system and electrostatic dust collector for the power house. This is a dry process, waste heat plant with five 8- x 120-ft. rotary kilns.

Miscellaneous installations and additions include an addition to a warehouse at Spokane and, at the various plants, tractors, well drills, locomotives, machine shop equipment, road maintenance equipment, etc. Where electric shovels have gone into service, in a number of cases changes had to be made to the electrical distribution system.

Slurry Filters Save Coal

(Continued from page 136)

duced one million lb. of steam per day and the auxiliary boiler produced one million lb. of steam at peak capacity. The 114,000 K.W. of electrical power generated was insufficient for mill operation under full load.

Heat requirement to produce a barrel of clinker has been reduced to 1,350,000 B.t.u. The waste heat boilers produce 1,250,000 lb. of steam per day which the new turbo-generators convert to 100,000 k.w. of power. Maximum plant load is 124,000 kw.h. per day, requiring that the auxiliary boiler produce sufficient steam to generate 24,000 kw.h. of power per day under extreme conditions. This is less than one-third the requirement from the auxiliary boiler before 1946.

Total steam required has been reduced by 25 per cent. If new turbines had not been installed, the auxiliary boiler would be required to produce 750,000 lb. of steam per day as compared to one million lb. before filters began operation. Overall saving in steam is one-half million lb. per day. Actually, the entire installation has added 6000 kw.h. per day to the plant load, which is largely offset by the reduction in load when the auxiliary power plant is inoperative.

Further economies in plant operation that will reflect in savings in fuel consumption will be effected by further plant improvements contemplated. Fuller inclined grate clinker coolers are to be installed, which will permit grinding of clinker as produced and materially increase grinding mill output through reduction of clinker temperatures as fed to the mills.

The plant produces standard portland cement, high-early-strength cement, air-entraining, mortar cements, and cement paints.

Peerless also operates a cement mill at Port Huron, Mich. Two kilns of 200-ft. length were joined into one 400-ft. long at that plant several years ago (ROCK PRODUCTS, March, 1943, p. 64) as a solution to rising costs of fuel.

W. C. RUSSELL is president of Peerless Cement Corp. and W. L. Kaiser is vice-president in charge of manufacturing. A. C. Eichenlaub is works manager, and C. J. Line, chief chemist, is assistant works manger, both with headquarters at the plant.

Survey Stone, Cement Company Equipment

MORE THAN $32,185,000 has been invested since the war in new plants and equipment in Pennsylvania by 25 glass companies according to an industrial survey conducted by the Department of Commerce of the Commonwealth of Pennsylvania. In addition, the survey showed a total of $8,586,417 invested for stone, including quarry products and abrasives companies; $7,846,583 for the cement industry; and $6,859,602 for clay, pottery and china companies, giving a combined total of $55,478,479 for the glass, stone and clay industries.

Opens Gravel Plant

BUCKEYE SAND AND GRAVEL CO. has been opened at New Carlisle, Ohio, by Horace Grisse, to sell top soil, fill dirt, sand and gravel.

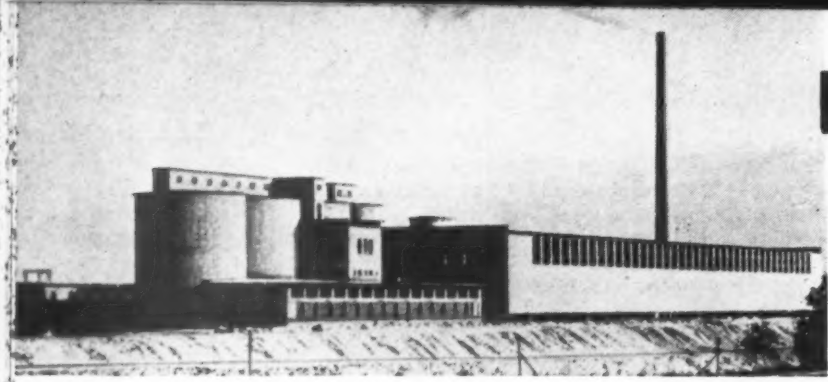


Fig. 1: Exterior view of modern European cement plant in Finland

European Cement

By G. ALBERTUS
and B. R. JACOBSEN*

A CHARACTERISTIC feature of the cement industry within most European countries during the war was a heavy demand for cement together with the lack of means to meet this demand, above all the lack of suitable fuel and manpower; moreover, the possibilities of procuring new machinery for expansion or replacement were inadequate, but some new methods and machines were introduced in order to remedy this drawback to some extent.

Raw Materials

At most places in Europe the method adopted is the Wet Process, but in Italy, Spain and Yugoslavia a number of dry process plants were working before the war, and still more have been added in recent years.

In many countries in Europe, particularly in its western regions, France, Belgium, England and Denmark, the available lime-bearing deposits consist of chalk of a softness rendering blastings unnecessary. The material can be dug directly from the ground by means of an excavator, and where the wet process is used, no preliminary crushing is required, because the materials are washable. In the case of the wet process plants, procedures vary therefore a good deal, dependent on whether the raw materials are washable or not.

The clay component is practically always washable. Washing of the clay usually takes place at the plant proper, but as a special development may be mentioned that in three cases which the authors have dealt with the clay is treated in a washmill placed on a barge floating in the clay pit (Fig. 2). In addition to the wash-mill (dia. 15 ft.), this barge carries an excavator with grab that takes the clay on board and a centrifugal pump drawing the slurry from the washmill through a flexible rubber hose and further into a permanent pipeline that conveys the slurry to the plant. The output of the largest of these three installations was about 45 sh. t. dry material per hour. It is obvious that this system offers advantages in regard to digging in water-filled clay pits and in regard to the clay transport.

Washable Chalk or Marl

These washable materials are discharged into one or more washmills together with the clay, which, however, may be washed separately, if required. The raw slurry is conveyed to a screen, which may be either a vibrating screen or a so-called TRIX, that, is a rotating screening device subjecting the slurry to centrifugal action.

The coarse fraction from the screen is treated in different ways at the various cement plants according to the nature of the raw materials. Frequently, it is conveyed to a washing drum where the flint is separated from the chalk, after which the wash water containing the chalk is returned to the washmill.

The fine fraction from the screen is conveyed to a tube mill usually working in closed circuit with another TRIX with finer sieves or with a special centrifugal separator without screen.

Hard Raw Materials

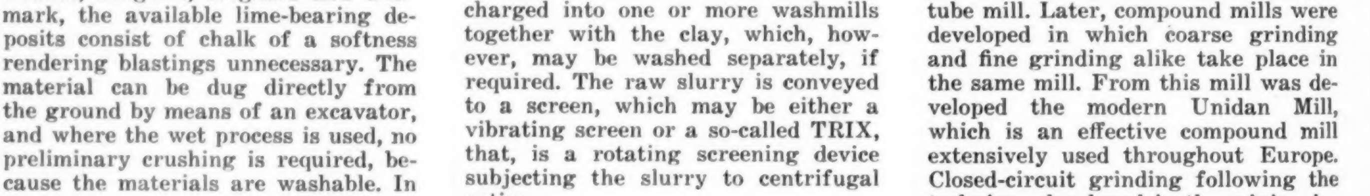
For primary crushing of hard materials some plants use one-stage crushing and others two-stage. The one-stage crushing is done in a slow-running hammermill which is capable of handling pieces up to 3 ft. For two-stage crushing a jaw crusher or a cone crusher is usually working in connection with a fast-running hammermill. In the second stage, cone crushers are sometimes used.

For many years, wet grinding of hard materials has taken place in a ball mill or Kominuter followed by a tube mill. Later, compound mills were developed in which coarse grinding and fine grinding alike take place in the same mill. From this mill was developed the modern Unidan Mill, which is an effective compound mill extensively used throughout Europe. Closed-circuit grinding following the technique developed in the mining industry is in Europe used at a few plants only. Due to the fact that at many places the raw materials are unsuitable for dewatering in thickeners, Unidan Mills, (Fig. 3) or similar compound mills are predominant. Contributing to this development is also the higher first cost of the closed-circuit grinding plant, the larger space it requires, and the various complications involved for proper operation.

The compound mills used in Europe are of a diameter up to 8 ft. 6 in. and of a length up to 60 ft., corresponding to a power consumption of about 1600 hp. The output of such a large mill corresponds to that of the largest rotary kilns, thus maintaining the preferred European principle of a single raw mill and a single cement mill only for each kiln. This is the simplest and moreover the cheapest solution, both as regards first cost and operating labor.

The modern Unidan mill is equipped with central drive, that is, the motor turns the mill trunnion through the

*Engineers of F. L. Smidth & Co. A/S



Developments

A survey with special reference to the war years and the time thereafter covering methods and machinery

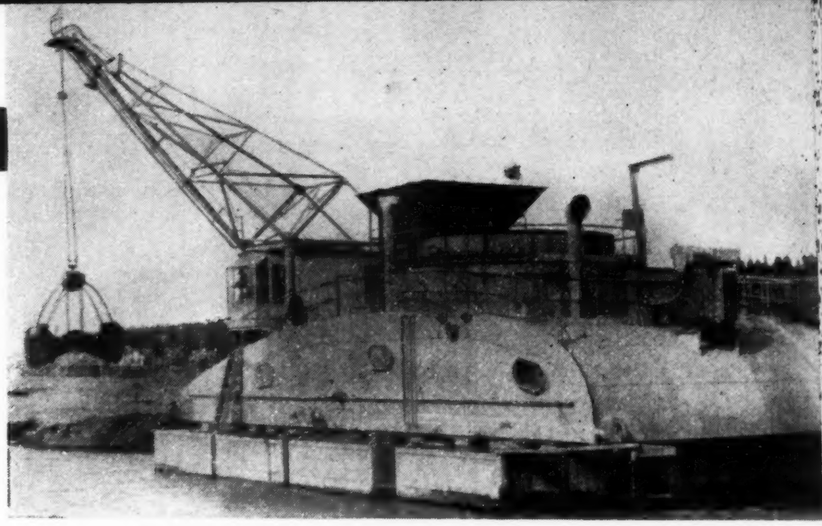


Fig. 2: Wash mill and shovel for clay mounted on floating barge

intermediaries of an independent oil-enclosed precision speed reducer, a membrane coupling and a torsion shaft. Large Unidan mills are provided with the so-called slide shoe bearings, by which is understood that the mill body, generally at its outlet end only, is equipped with a tire or slide ring surrounding the shell, the other bearing being an ordinary trunnion bearing. The slide ring rests on slide shoes, and during operation a thin oil film maintained between slide ring and slide shoe keeps the friction and the consequent wear at a minimum. The slide ring is located at such a place on the mill as is found most appropriate in view of load distribution, preventing cracking of mill shell.

At a couple of Scandinavian cement plants, closed-circuit grinding in a ball mill with rake classifier is used in connection with flotation. In this case the slurry is conveyed from the classifier to the flotation plant. Subsequently, dewatering takes place in a thickener, correction materials are added to the thickener underflow, and the slurry is finished ground in a small tube mill. Thereafter the slurry is mixed in correcting tanks and slurry basins and finally fed to the rotary kiln.

These plants which have adopted the flotation process are located in Sweden and Finland. The flotation process requires a particular technique and special apparatus and is handled through cooperation between Separation Process Company, Catasauqua, Penn., U. S. A., and F. L. Smidth & Co., Copenhagen, Denmark.

The flotation process has rendered it possible to use raw materials which, in their natural state, are not of the proper chemical composition. Those components which are present in excessive amounts are separated from the desired components in flotation cells, thus avoiding an expensive, troublesome and less effective sorting by hand, and the use of expensive correction materials, and ensuring a higher degree of utilization of the raw materials.

Originally, also dry grinding was nearly always caried out in two stages by means of a ball mill or Kominuter and a tube mill. Later on it became the practice in Europe to use compound mills of the Unidan mill type as in the case of wet grinding. Considering that the hard raw materials have to be subjected to drying and grinding, mills in which both drying and grinding can be effected at the same time have come to the fore in Europe. A mill of this type is the Tirax mill.

Dry Grinding of Hard Materials

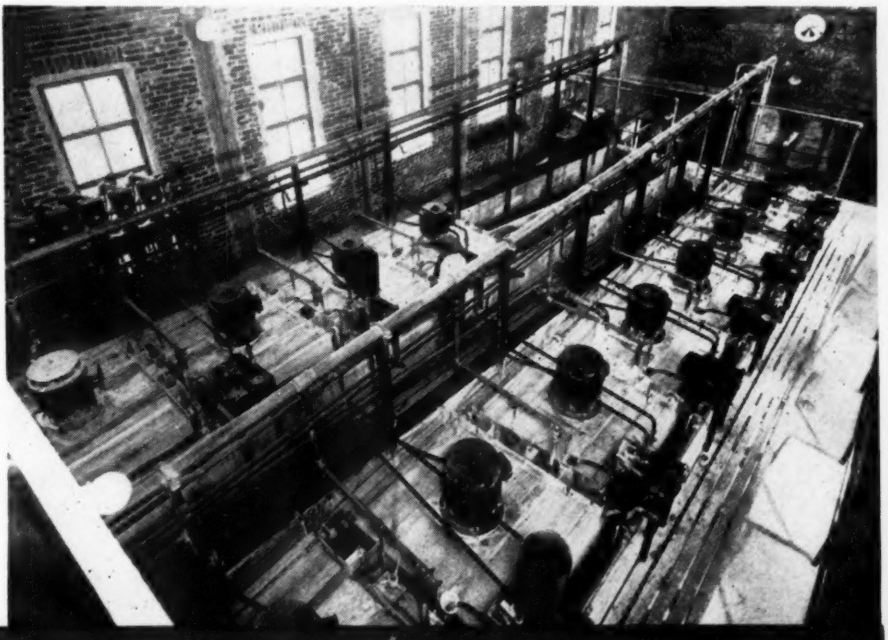
In this mill drying is effected by airsweeping the mill with either cold or hot air, dependent upon the moisture content of the material, the raw meal being simultaneously carried out of the mill by the airsweeping. At some plants the Tirax mill is, according to the nature of the raw materials, equipped with a special drying chamber before the grinding compartment or compartments. In regard to mechanical design, the Tirax mill is similar to the Unidan mill. The slide shoe bearing at the outlet end is of particular advantage compared with a trunnion bearing, because it allows to dimension the outlet with due regard to the large amount of air and material passing through the mill. The material-laden air is conveyed to an air separator that returns the coarse particles to the mill for renewed grinding, while the fine fraction is passed on to a cyclone precipitating the finished ground material.

If hot air is used for the drying, this can be taken as gases from a special furnace, but very often hot exit gases are available from the cement kiln.

Where cold air is used, the Tirax mill has been able to reduce the moisture content of the raw materials by a few percent, and when hot air is used, raw materials with 8-10 percent moisture have been successfully handled. The largest Tirax mill for drying and grinding cement raw materials has an output of 40 sh. t. per hour.

Tirax mills for drying and grinding cement raw materials have been used extensively in Italy.

For feeding the mills, most plants in Europe use feed tables, but recently the weighing type of feeders



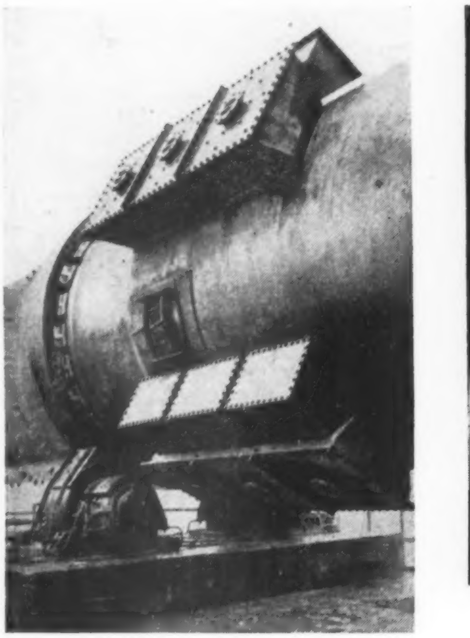


Fig. 7: Kiln with slurry preheater

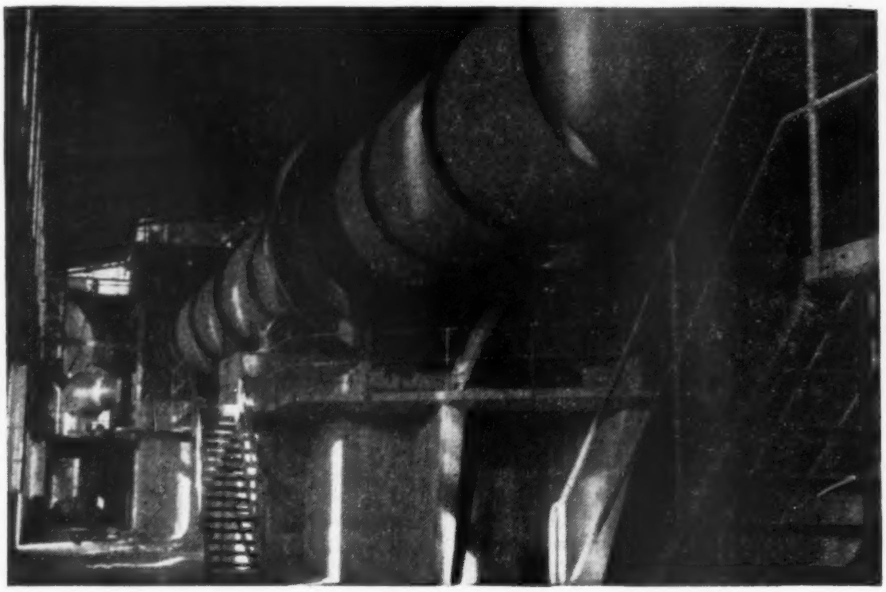


Fig. 6: Unax kiln No. 2 at a cement plant in Switzerland

such as the Pendan weighing belt have gained ground. Besides as mill feeder the Pendan weighing belt is also used as production recorder after mills for materials like raw meal and cement.

Among innovations in regard to control equipment in the raw mill may be mentioned a rotating, continuously acting slurry viscometer installed at some wet plants. It indicates at any moment whether the slurry is of the proper consistency so that any irregularity in that respect can be corrected at once.

Another development in mill control is the Folaphone, an electric acoustic device for measuring the material level in both wet and dry mills.

Homogenizing of Raw Materials

In the case of slurry, the proper composition is at some plants ensured by means of mixing tanks using a combination of mechanical and air agitation, while others have silos with air agitation only.

It is far more difficult to ensure complete uniformity of the dry raw meal, but homogenizing by air agitation is now used successfully in Europe, and a number of dry process plants have in recent years installed Fluxo homogenizers.

These homogenizers consist of cylindrical mixing tanks provided with agitators. The tanks are used either for continuous or intermittent operation, the raw meal being fluidized in the tanks through addition of compressed air.

Clinker Burning

The general practice with wet process plants in Europe is to use long kilns equipped with chains in the drying zone. Many such kilns are operating with a fuel consumption of about 1,000,000 B.t.u. per bbl. of clinker (1400 kg/cal. per kg) with 36 percent water in the slurry.

During the war it became of the utmost importance to reduce the fuel consumption to the minimum, and several existing kilns were equipped with special devices, commonly called slurry preheaters, for the purpose of increasing the heat exchange between the slurry and the kiln gases, and so to speak "squeeze" the last heat content of the gases. These kilns now op-

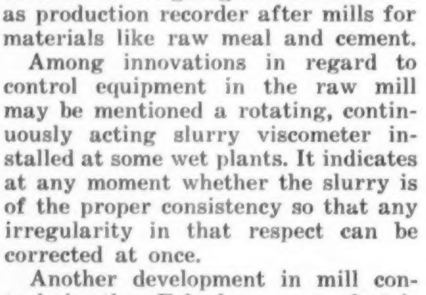


Fig. 10: Patented cement cooler

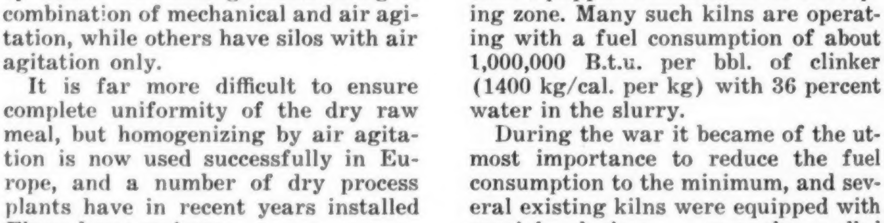


Fig. 8: Unax kiln with centralized control panel. Note flow diagram with indicating lamps for kiln and coal mill

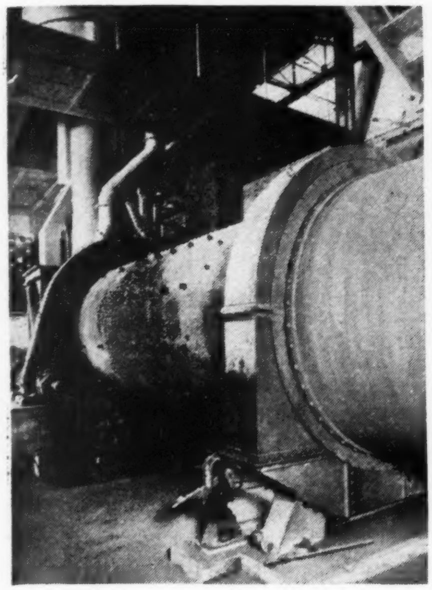


Fig. 5: Tirax mill with slide shoe bearing

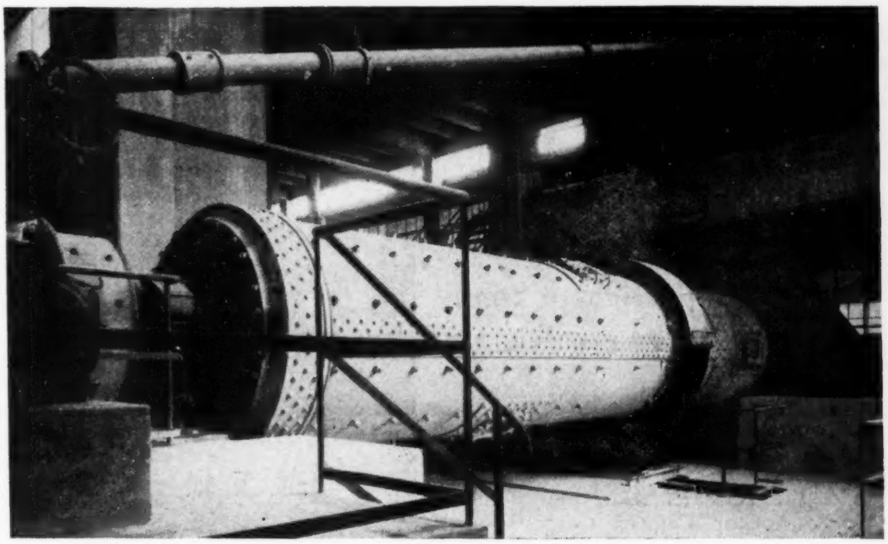


Fig. 9: Unidan mill with slide shoe bearing

erate with a heat consumption as low as 900,000 B.t.u. per bbl. of clinker (slightly below 1300 kg/cal. per kg) with 36 percent water in the kiln slurry. Before each such preheater installation it has been carefully considered that the kiln dimensions and the raw materials were fit for the preheater process. At some plants new kilns have been started with slurry preheaters.

The slurry preheater (Fig. 7) consists of a number of compartments with perforated walls allowing the passage of gases and slurry. Each compartment contains a charge of loose heat exchanging bodies.

In passing the preheater the slurry temperature is increased to about 170 deg. F., and a few percent of water is evaporated. When the gases pass in the opposite direction, the greater part of the dust is caught by the slurry. For a kiln equipped with a preheater it may therefore be possible to dispense with the installation of an expensive dust filter, which might be necessary for the ordinary kiln.

With regard to the alkali question, it has been found that the preheater causes only a slight increase in the alkali content of the clinker and the increase has been smaller than might be expected from the amount of dust precipitated in the preheater. Inasmuch as the amount of dust in the exit gases from the kiln with preheater has been decreased, the concentration of the alkalies is higher than in the ordinary kiln dust. At one plant with electro-filter this was directly proved in that the precipitated dust contained an increased percentage of alkalies after the installation of the slurry drier. This dust, containing about 75 percent alkali salts, was sold as fertilizer.

The temperature of the exit gases is 260-300 deg. F. which is just above the point where water may condensate in the stack.

In case of the dry process kilns, it has likewise been found possible to improve the fuel economy during the war years. At most places in Europe, the raw materials are of sufficiently plastic nature to form the raw meal into nodules. The nodulization takes place in special nodulizing drums, and the nodules are fed to the kilns with 10-15 percent water. In such high-economy Unax Kilns the heat consumption has been found to be only 750,000 B.t.u. per bbl. of clinker (1050 kg. cal/kg). Such kilns are provided with special heat exchanging devices in the upper end. The pressure drop through the kiln is approximately ¼ in. water column only. Particularly in Italian cement plants, kilns of this type have been put into operation during and after the war.

As far as is known, all these kilns have been fed with raw meal which has been nodulized beforehand. This ensures uniform treatment of the raw materials during their entire passage through the kiln, and flushing is avoided.

Besides the above described heat exchanging devices built into the kilns there were already before the war at a number of plants, both wet and dry, installed separate preheaters of various design ahead of the kilns.

Clinker Cooling

In regard to clinker cooling, the Unax cooler (Fig. 8) is one of the most widely used in Europe. The cooler tubes are planetarily arranged around the extension of the kiln tube which gives low kiln foundations, no false air entering between kiln and cooler, and maximum heat recuperation.

At some plants it is desired to obtain clinker which is cool enough to be taken directly to the cement mills. In that case more air is drawn through the cooler than is required for the burning in the kiln, and arrangements have been made to withdraw the excess air from the outlet end of the kiln to be either utilized for drying of coal, or wasted.

The question of air-quenching the

(Continued on page 183)

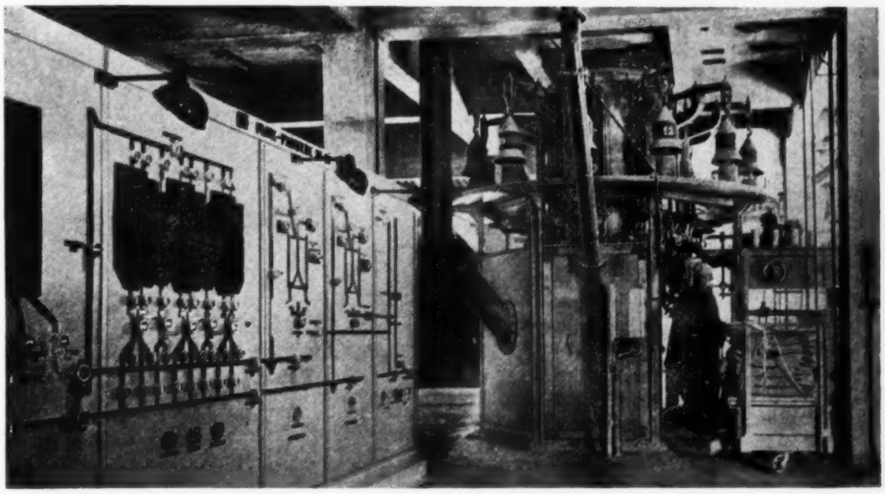


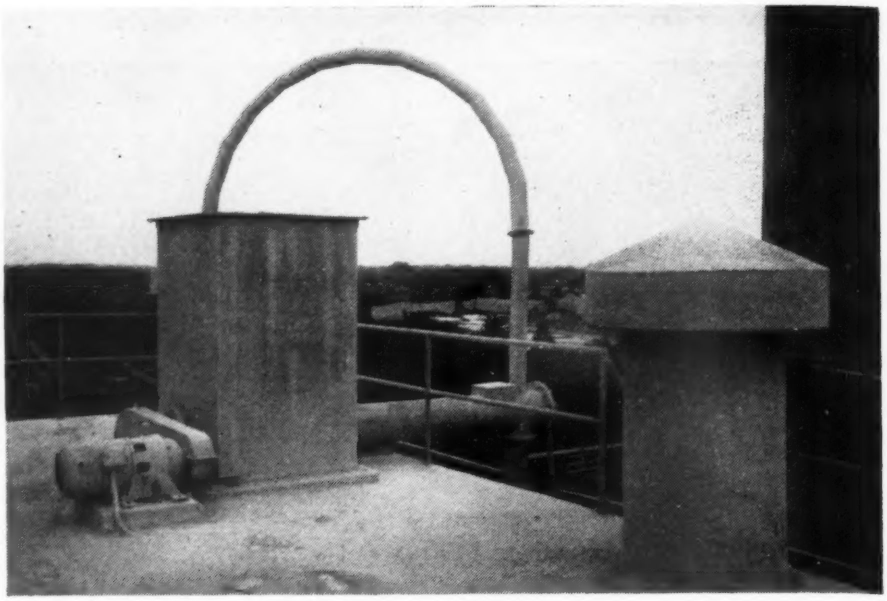
Fig. 12: Twelve-spout rotary Fluxo packer and control panel with flow diagram for cement transport system

Lone Star Feeds Kiln With Air Lift

Air lift feeder at Spocari, Ala., plant provides a controlled flow of dry feed

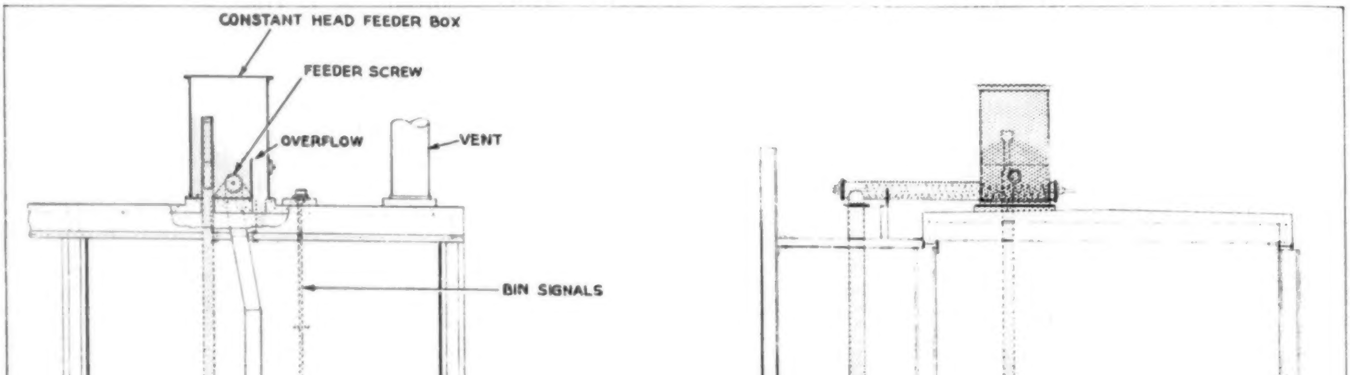
By W. B. LENHART

AT the Spocari, Ala., plant, the Lone Star Cement Corporation has installed a Fuller air lift kiln feeder to convey dry feed in a controlled flow to one of the kilns. The device has been in operation sufficiently long to have given the apparatus a thorough trial and demonstrate its efficiency.



Air lift delivers into the bottom of this rectangular box. The screw conveyor in pipe (10-in.) at right feeds the kiln. Arc-shaped pipe is a vent

Two 10- x 150-ft. Allis-Chalmers kilns are operated at this plant. One of the kilns is still being fed by two reversed screw conveyors, the short feeder leg taking material from the main cross conveyor, which is longer, and delivering a controlled quantity to the second screw and returning the



Elevation drawing of air lift kiln feeder at Spocari. Kiln feed materials are aerated and caused to flow from the bin up through the discharge pipe into the constant head feeder box, and the feeder screw discharges uniformly into the kiln feed spout

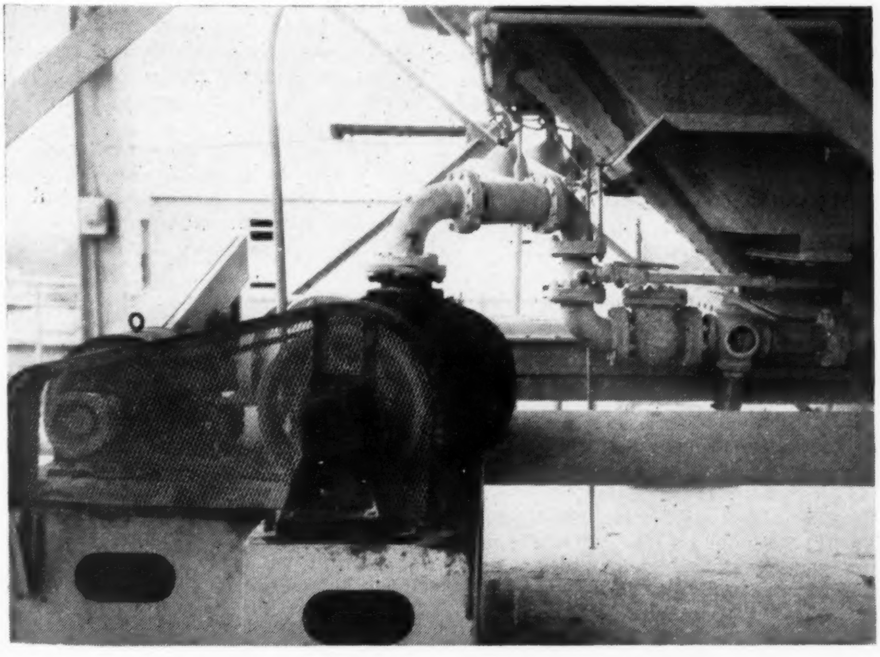
excess. This arrangement of the two conveyors is designed to help reduce flooding.

The air lift feeder has been installed on the second kiln. The device is very simple to install. In the steel, hopper-bottomed kiln feed bin has been installed a vertical 6-in. diameter pipe, flared at the lower and intake end to 12-in. diameter. This is the air lift pipe through which flows the dry mix to the "constant head box" located on top of the kiln feed bin. Air at 3 lbs. pressure is introduced into the flared end of the 6-in. pipe through a porous concrete member designed to allow an easy flow of air through it and to not plug up from any moisture that might be introduced with the air. So far the porous block has given no trouble.

In the constant head box, a 10-in. diameter screw conveyor operates in a pipe housing. The powdered mix comes into this box at the bottom. The constant head box consists essentially of two compartments, the inlet and the outlet compartment, and the two are separated by a low steel baffle that functions to keep a constant level of material in the section holding the screw conveyor. The excess of material flows over the top of the steel baffle and returns to the feed bin by gravity. The constant head box is about 36- x 36-in. and 6 ft. high. It can be readily seen that by carrying a small amount of powdered material in the constant head box, and this material is always constant in volume, that flooding is practically eliminated. The device is positive and works equally well regardless whether the kiln feed bin is full of material or near empty. The unit has a maximum capacity of 21 tons per hour, control being regulated by the r.p.m. of the 10-in. screw conveyor. Air is supplied to the unit by a 750 c.f.m., rotary Fuller compressor driven by a 15-hp. Continental motor. The unit which is mounted on the deck just under the kiln feed bin, is connected as shown in the illustration. The total lift is about 20 ft. The constant head box is vented to the outlet of the screw conveyor by an arc-shaped 3-in. steel pipe. The steel kiln-feed bin and the entire assembly is mounted above the kiln, with the material dropping by chute from the conveyor to the kiln.

At the Spocari plant the raw material is a soft formation known as Thelma chalk. It is excavated in the pit by means of a vertically operated excavator that operates on the principle of a vertical bucket elevator wherein the up-going bucket digs the material. The chalk is dried in a waste heat, rotary dryer that was recently shortened to make room for the Buell dust collectors which have been installed at this point. The dryers were originally 9½- x 125-ft. On the raw side, Allis-Chalmers compeb mills are used for raw grinding in conjunction with Sturtevant separators. Drags deliver the material from the dryer to the compeb mills.

The Spocari plant is located southwest of Birmingham, Ala., and is operated through that office. C. E. Fontaine is vice-president in charge of the Alabama operations of the Lone Star Cement Corporation. G. W. Engelhardt, is superintendent, and A. L. Kilgore, chief chemist.



Rotary blower supplies air at 3 lbs. pressure for the air lift

Plan Cement Plant

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., contemplates construction of a cement plant at Jacksonville, Fla.

Silica Sand for Glass

QUARTZ content of sand should be high if it is to be used to the best advantage in the manufacture of glass. Silica sand is composed chiefly of quartz grains. Until recently, the general chemical characteristics of a satisfactory glass sand were: very high silica content, low alumina and alkali content, and very low iron oxide content. Because of changes in glass-sand sources of supply and revisions in glass-making techniques, sands of high alumina and alkali content are being utilized providing the alkali content includes little or no magnesia. Alumina, in some forms, tends to decrease the transparency of the glass, and both alumina and magnesia raise the melting point of the glass "batch."

Although physical characteristics of silica sand are not so important for glass as are chemical ones, uniformity of grain size is desirable for greater ease of melting. All material should pass a 14-mesh screen and be retained on a 100-mesh; 65 per cent should pass a 20-mesh screen and be retained on a 65-mesh. Either rounded or angular grain sands may be used, but the latter melt more easily. Both unconsolidated deposits and weakly cemented sandstones can be utilized for silica sand. Consolidated or cemented deposits are broken down to grain form by hydraulic or crushing methods.

Bolivia Cement Production

THE LOCAL CEMENT FACTORY in Bolivia, which in 1946 produced 185,000 bbls. of cement of 175 kilograms each, increased production in the first six months of 1947 to 103,000 bbls., according to a report in *Mineral Trade Notes*. Average monthly production was 17,250 bbls. The increased demand resulted from various construction projects underway or contemplated in the country and exports of 12,500 bbls. to Peru.

Discusses Refractories

THE EFFECT on refractories of the gases, solids and liquids with which they come in contact, including lime, portland cement and magnesia, was discussed recently by C. L. Norton, Jr., technical director of the Refractories Division of The Babcock & Wilcox Co., New York City, at a meeting of the Philadelphia section of the American Ceramic Society.

Lightweight Aggregate

LEHIGH MATERIALS CO., Tamaqua, Penn., has announced that it will soon be in production of a new lightweight aggregate, Lelite, which has as its base, slate and coal. A specially-designed furnace is expected to attain a yearly output of 125,000 tons.

Equipment for lifting and carrying heavy machinery around a cement plant yard

Material Handling

Portland cement industry finding increasing use for industrial power trucks to reduce material handling costs and clean-up work. Use of trucks also has cut down physical hazards

Waste-Chasing Transportation

By I. F. LEGORE*

NEW TOOLS for lifting, carrying, moving and placing materials are adding to the traditional productivity of American industry and are helping make work easier and safer. The rapidly increasing use of small gasoline and electric powered trucks and cranes in modernizing handling methods is reducing back strains and the sprains of hands and arms from lifting, and the foot and leg injuries from falling objects that accompany manual handling.

The handling of material adds to its cost and introduces hazards into its processing without adding to its value. Material handling has become so important a subject that books are devoted to its discussion, universities offer courses in it, consulting offices are doing a brisk business and designers are improving powered handling equipment to make it more versatile.

Some say that 90 percent of all industrial activity is material handling and the balance is actual processing. Others estimate that handling expenses alone amount to about one-third of the labor payroll of manufacturers and that approximately 80 percent of the workers handling materials are doing it manually.

*Assistant Manager, Accident Prevention Bureau, Portland Cement Association.

Lift truck equipped with an improvised crane attachment for moving heavy materials and equipment

Whatever the amount of work so expended may be, mounting costs and increased exposure to wasteful accidents are convincing businessmen that handling should be reduced to a minimum and that it should be done mechanically wherever possible. Extravagance with manpower can hardly be tolerated when there is need for the elimination of waste of all kinds.

Handling Injuries Frequent

Strains and over-exertion from manual lifting and carrying, pushing, pulling and stacking rank high as sources of industrial injuries. The National Safety Council says that one-fourth of all compensated injuries and one-fifth of all compensated permanently crippling injuries in 11 leading industrial states were the result of unsafe methods in handling of moving parts and equipment.

These same activities ranked fifth among the causes of disabling injuries to employes of member plants of the Portland Cement Association in 1947. Such incidents as these represent loss of productivity by the employer and curtailment of income by the injured:

In helping unload channel iron from a motor truck, injured was walking backward while carrying one end of the iron. Catching his heel on a rough spot in the floor he fell, causing channel iron to strike his right leg and fracture both bones below the knee. He lost 111 days' time.

•

As injured was rolling a 300-lb. trunnion to the machine shop, the trunnion started to tip and he tried to hold it with his hands. A protrusion on the side of the trunnion pierced his right hand. He lost 10 days from work on account of his injury.

•

While injured was moving a section of screw conveyor which he had removed from its housing, the screw slipped from his grasp and the sharp edge of the flight cut his hand, injuring the tendons. A month's time was lost.

•

In lifting a bar of steel shafting, injured strained his back, partially dislocating vertebrae. He lost 28 days.

•

While injured was lifting a drum of oil onto an oil rack, he strained his back. Nine days' time lost.

•

As injured bent over to pick up a liner plate to move it from the storeroom, he strained the muscles in his back. He lost four days.

•

In attempting to lift a heavy pulley and pinion on a shaft, injured slipped and fell to the floor and the pulley rolled on his arm, causing bruises and contusions that cost 24 days away from work.

•

As injured and a co-worker were loading pipe casing onto a truck, the other man slipped so that the entire weight of the casing was thrown on injured. He lost five days on account of a wrenched back.

•

There are few activities in which physical adequacy and the faithful use of safe methods of working are more important than in the manual handling of materials. Experienced and properly trained workmen can avoid these injuries.

Regardless of the weight, shape or size of the object to be lifted and car-

ried, workers must use the proper lifting technique or risk strain in handling even relatively light objects. The principles are well known; size up the load and do not try to lift more than can comfortably be handled; bend the knees and keep the back as straight as possible; lift with leg and arm muscles, keeping the object close to the body; do not twist the body to change direction, lift the object to the carrying position and turn the whole body, including the feet.

Mechanical Handling Devices

For years, such equipment as block and falls, chain hoists, electric and air hoists, jib cranes, portable floor cranes, winches and overhead cranes have hoisted, loaded and unloaded weights that are too heavy for men to lift. Such conveyor types as roller, belt, chain, screw, pneumatic, monorail and aerial tramway have carried weights that are too heavy for men to carry. Use of these mechanical aids for getting work done efficiently and safely expanded through the period between the World Wars.

In the 1920s small industrial platform trucks were in use. Powered by storage battery or gasoline engine, they were principally useful in transporting tote boxes and miscellaneous materials.

A variation was the low lift truck with a platform that elevated from 4 to 6 in. Run under a skid on which loads were placed, the truck could lift and transport the skid, then lower its load and back away. It was important that the load be properly piled and balanced on the platform or skid.

An outstanding development was the high lift truck designed to tier loaded skids one above the other. An improvement was the equipping of the high lift truck with a fork requiring less clearance than a platform so that shallow pallets (trays) could be used. Double-faced pallets permitted wider load distribution and afforded an advantage in tiering in that their broad lower bases offered much firmer support in the tier than did the legs of skids.

Lift Trucks Versatile

Fork lift trucks proved themselves during World War II, when time and labor were extremely short. Their adaptation to a broader range of jobs and their use in various types of industry has developed rapidly.

On the tray-like pallets, one big load can be made out of a number of small ones. Loads can be tiered up to 18 ft., considerably above the height to which men can stack manually, conserving both time and storage space. Damage from handling is reduced substantially, and the bumps, bruises and muscle strains decline.

Special power trucks have been developed for handling items of sizes, shapes and forms that are not adapted to trailers, skids or pallets, or that are unit loads in themselves.

Scoop trucks shovel loose bulk materials and elevate and discharge them into hoppers, bins or motor trucks or onto belt conveyors. They handle sand and coal with ease and are found to be more versatile than bulldozers for snow handling in that they not only plow out walkways and roadways, but also scoop up the snow and load it quickly into motor trucks for removal.

Powered truck attachments besides forks and scoops are cranes and grippers. One truck eliminates the pallet. The load is placed on a piece of cardboard, so that an edge of the cardboard protrudes at the front. Claws grip that edge, and a mechanism pulls the loaded cardboard onto the carrying plate. The machine then carries and stacks the load like a fork lift truck, a pusher mechanism moving forward over the carrying plate to discharge it.

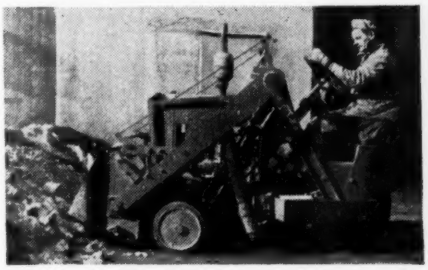
Another variation is the pneumatic fork which has pneumatic tubes set in four prongs. With it, concrete masonry units can be loaded without using pallets. Tubes fit between the properly spaced rows of blocks on the bottom layer and squeeze that bottom row of blocks into a fixed position, equivalent to a pallet.

Compact but mighty in their ability to handle loads up to several tons in weight, the versatile high lift powered trucks can enter railroad cars, trucks and trailers and can pass through other low-clearance portals. They maneuver in narrow aisles and crowded quarters.

In initial experiments with the small powered trucks, cement manufacturers are finding the scoops and the truck cranes to be well suited to their requirements. Bulldozers are invaluable in keeping quarry floor surfaces cleared and in moving materials in general housekeeping work outdoors. Scoop trucks not only push materials together into piles, they also scoop up the scrap, brick and dirt, hoist and load it into motor trucks or railroad cars. They facilitate the loading and unloading of such materials as gypsum and sand.

While objects weighing upwards of a half-ton can be safely handled by the two-wheeled hand truck, the hazard rises rapidly as the weight increases above a few hundred pounds. Truck cranes having a maximum capacity of 10,000 lbs. are proving their worth in lifting and moving heavy objects in shop and general repair work as well as in the yard.

Scoop equipped tractor loader used by a Kansas cement mill for clean-up, handling of scrap, brick, etc.



Car-scoop has been found very useful by a Pennsylvania cement plant

As ramps and elevators replace steps as means of access to the various locations in cement mill buildings, rubber tired power trucks can be made increasingly useful throughout the plant in many ways. When heavy repair parts, materials and supplies are received, they can be unloaded and stored by the pallet-bearing truck; then when needed can be quickly picked up and borne to the job locations without loss of time, motion or unnecessary handling, with handling hazards minimized.

Parts requiring repairs, such as screw conveyor flights and electric motors, can be safely lifted and carried to the shop and back again to the job site. Oil drums, kegs of nails or bolts and similar supplies can be quickly and easily handled.

A new cement mill nearing completion is equipped with a bridge crane traveling the length of the mill building for servicing raw and finish mills and the discharge end of the kilns. Mills not so equipped may be able to facilitate such operations as the handling and charging of steel balls at raw and finish mills by means of the industrial crane trucks.

Where the kiln burning floor is too high to be reached by means of a ramp, an elevator might be used of a capacity sufficient to accommodate power trucks carrying pallet loads of fire brick, motors or other heavy repair parts.

Paper and cloth bags and the special types of cement stocked in bags may be stored on pallets for moving by lift truck.

The use of industrial power trucks introduces some hazards that must be taken into account. Many of the accidents that occur in their operation arise out of collisions with fixed objects when the operator is backing or maneuvering to make a sharp turn. Substantial guards are required, of sufficient height to protect operators from crushing injuries.

(Continued on page 176)

Chemist Corner

Control of Portland Cement RAW MIXTURES

By Dr. E. J. SPOHN*

CONVENTIONALLY, the Portland cement raw mix is controlled by determination of the carbonate content. Several good methods are known for rapid determination of the carbonate content. The trouble in using these methods is that the carbonate requirement is not always exactly known. It changes with variations of the acid components, and with variations of MgO. MgO is determined by these methods as a basic component; in the clinker however, MgO is uncombined.

If the complete analysis is known, at least CaO, SiO_2, Al_2O_3, Fe_2O_3 and MgO, the exact carbonate requirement can be calculated. Such methods of calculating the carbonate requirement have been propagated by Kuehl and even more extensively, by Dahl†. These methods have substantially improved our understanding of the complicated stuff called cement clinker. They taught us why slight changes of the oxide composition might result in essential changes of the potential composition and of the cement quality. They made it evident why a reliable high grade product could never be made from a raw material with inconstant values of SiO_2 or MgO with conventional methods. They certainly can never be replaced by anything else for certain purposes.

They also are widely used for routine testing in works control. Only two minor objections could be made against this use. First, the change of the carbonate requirement makes it impossible to check the effect of the blending process by the carbonate determination alone for the raw mix never will have a constant carbonate value. Second, the raw mix analysis presumes a complete acid solubility. As a matter of fact the clinker is not completely soluble nor is the calculated potential composition a reality. It depends on the special burning conditions.

It is not necessary to point out that these two objections are no serious argument against these methods. They work excellently as far as the raw material is uniform and, therefore, the complete analysis is not required very frequently and quickly. But things become difficult if the raw materials vary and quick changes occur. Many efforts have been made to reduce time and costs for the complete analysis and some improvements have been made in this direction. But there are raw materials which would require a new analysis every hour and also the most advanced methods would be too slow. Such materials must be handled with additional costs in a wet process and require huge mixing tanks.

Such costs could be considerably reduced if there were an analytical method which would permit determining directly and quickly the amount of deviation from the lime requirement. Such a method has been employed by the author for many years and has proved its value. It is based on the well known determination of free lime in the clinker.

Test Raw Mix Sample After It Reaches Proportioning

The new idea was to test not the clinker coming out of the kiln, but to draw a raw mix sample right after the proportioning point, usually after the raw mill, and to burn it in a laboratory furnace under well defined conditions. These conditions are fixed by a preceding series of comparative tests with the "technical" clinker which may be repeated in regular intervals. The free lime is determined in

* Ordnance Research and Development Division, Fort Bliss, Texas.

† Dahl: The problem of proportioning Portland cement raw mixture. Rock Products Jan. 1947. The terminology well defined by Dahl is presumed and may be used in this paper.

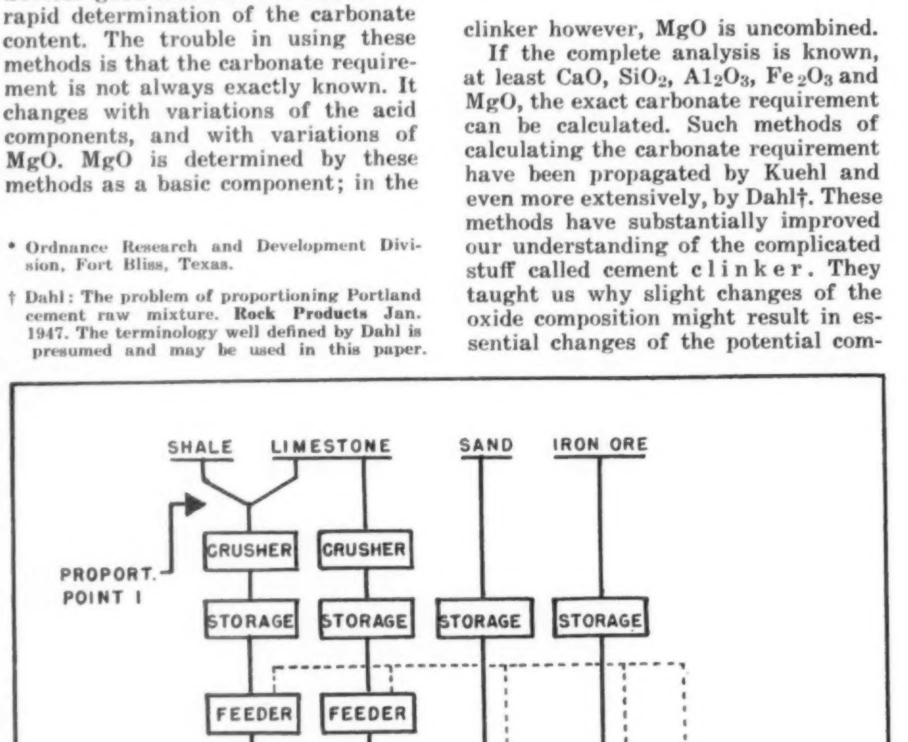


FIG. 1

Fig. 1 shows three proportioning points on limestone and shale crushing; (1) before the crusher; (2) following the feeders; and (3) comprising the scale which records mill input and the two proportioning scales to weigh small additional percentages of iron ore and sand

the laboratory clinker thus obtained.

There might be the objection that there is no free lime at all. Assuming there would be free lime: A free lime content up to 1% could not be detected by the routine soundness test and would not interfere with the specifications. A content up to 0.5% could not be detected even by more sensitive tests such as the tensile strength.

However, free lime is no improvement. It is avoided by the following procedure: Before burning, the raw mix sample is thoroughly mixed with a fixed percentage of pure $CaCO_3$. After burning, the remaining amount of free lime is "titrated back". So, in a way, a negative value of free lime is obtained by calculation. This value may be called the "deficiency of lime".

Or, on the other hand, the carbonate requirement might as well be calculated from this value and used as a holding point for the calcimeter test. This was the original application of the method. At that time the determination of the carbonate requirement, including preparation of the raw mix, burning and analyzing, took five to six hours. The value thus obtained gave the new holding point for the calcimeter tests of the following eight hours shift. Every shift had to undertake the procedure of one free lime determination. That appeared to be quite a performance 10 years ago.

Later on it was learned that the method could be easily improved. The laboratory furnace was equipped with an automatic temperature control and worked continuously day and night without supervision. Temperature was recorded and gas supply automatically cut off in case of a broken thermocouple or any other hazard. From that time on, the life and dependability of the furnace was surprisingly increased. The burning period for a sample could be reduced to 30 minutes, since there was no more heating up and cooling down of refractory material.

The addition of $CaCO_3$ before burning could be abandoned again, because the raw mix always requires a certain lime excess to compensate the influence of the coal ash. This excess proved sufficient for control needs in this special case. Its amount was soon learned by comparative tests and changed slightly when another coal had to be used. At the same time it was learned how to complete a free lime determination within 20 minutes. So the final result was obtained within an hour or less after sampling.

Eliminating Calcimeter Test

The next step was the elimination of the calcimeter test. Samples were burnt every hour for determination of the free lime. The free lime value was used directly instead of the former carbonate value for adjusting the proportioning scales for limestone and shale. This was eight years ago. From that time on the method has been working with the precision of a watch and the calcimeter has never been used again.

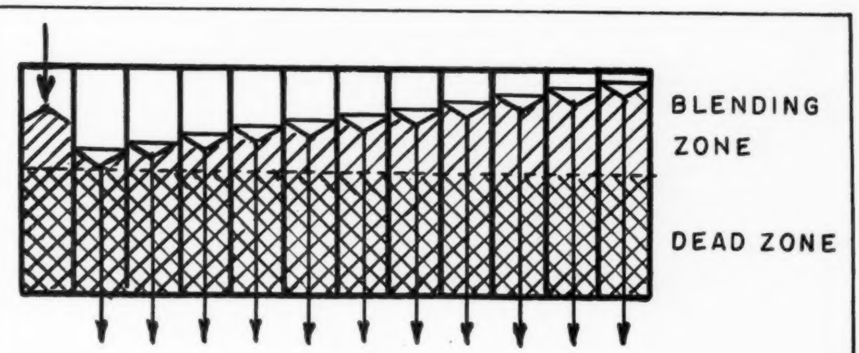


FIG. 2

Fig. 2 illustrates dead zone condition which develops when one silo is fed after another in short intervals

Cement qualities were remarkably improved in spite of the fact that the company had to switch to a less uniform raw material. Some big customers who had the cements regularly tested by material testing institutes, soon realized the improvement and began to prefer this trade mark for highway paving and other such purposes, where quality as well as dependability was important.

With the old method, overburden always had been carefully removed and discarded. Its content of combustible organic matter would have caused an error in the weighing portion of the carbonate determination. The new method saved all costs for removing overburden. Even old piles of overburden were picked up again and utilized.

Uniform Burnability Increases Output

Another advantage was found in the burning process. The "burnability" became so uniform that the kiln output was increased, shutdowns caused by sticking and ring formation were reduced as well as the coal consumption. Also the grindability of the clinker became more uniform.

The method could be especially useful if MgO is present in a varying amount. MgO is determined as equivalent to CaO with the conventional carbonate determination. In the clinker, however, MgO will not substitute for CaO in its compounds. This causes an error in the carbonate determination which could be compensated only if MgO does not vary. If MgO is expected to vary, the lime level must be kept lower than usual to prevent unsatisfactory soundness tests. Unlike the carbonate determination, the free lime method is free from this handicap. MgO remains as inert in the test as in the clinker and the lime content may be held at its upper limit without any danger.

In spite of all these advantages, the method has not become popular in Europe until now, like so many technical improvements not directly used for war. The main reason was that additional platinum for crucibles and thermocouples was not available. The current costs for platinum are low, however, and the technique of handling this metal which is very soft at high temperatures, is learned in a short time. Nor has the high temperature furnace become standard laboratory equipment until recently. Carborundum or molybdenum furnaces—the latter with reducing atmosphere —did not work satisfactorily. Most platinum resistance furnaces have a very short life. It should be possible to build a suitable design with Plati-

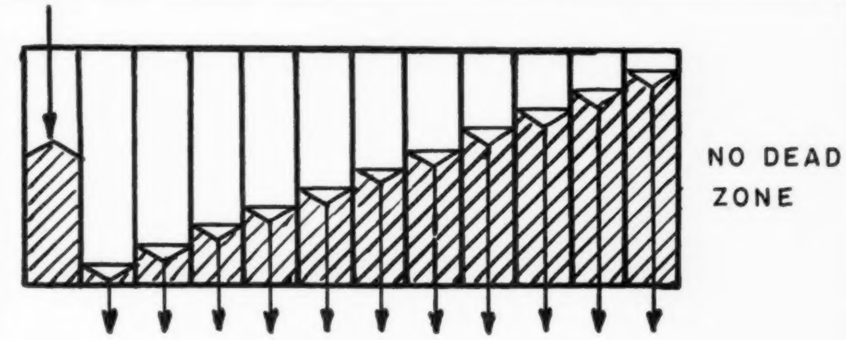


FIG. 3

Fig. 3: Normal condition without any dead zone when silos are not fed until they have been completely emptied and then filled completely in one operation to utilize full blending capacity

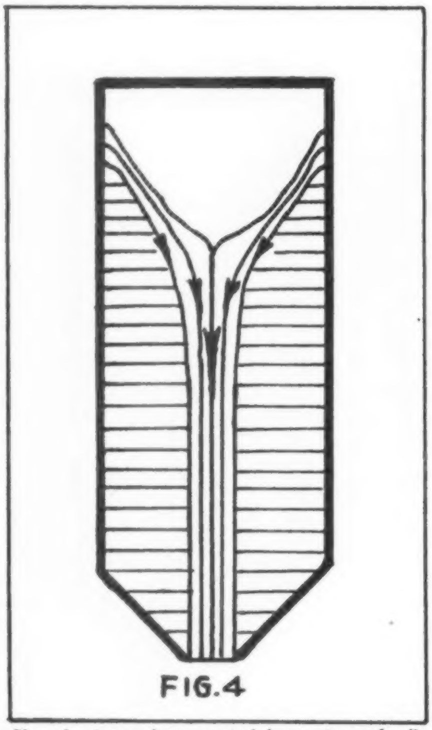


Fig. 4 shows how material on top of silo leaves first

num-Rhodium. In fact the least expensive type of furnace was the best and a simple but well designed gas heated furnace gave quite satisfactory results.

The initial difficulties of the method were overcome many years ago. It is ready for general use not only for extremely difficult material. It will be found convenient in every case as an up to date routine control.

Method of Application

The general report about the method may be completed by referring to detail of its application in the production process. The dry process plant which started the method may be described. It is a good example because few plants will find more difficult conditions. The raw mix was composed of four materials in order to adjust the four main components CaO, SiO_2, Al_2O_3 and Fe_2O_3.

The ratio $Al_2O_3 : Fe_2O_3$ is essential for burnability, corrosion resistance against sulphates, and shrinkage. It was possible to maintain the desirable ratio by a proportioning scale for iron ore and by conventional analytical methods.

The ratio $SiO_2 : R_2O_3$ is not especially constant in the raw material. The well functioning scale for additional quartz sand could not alter this fact because SiO_2 analysis is too slow. This had always been the main source of difficulty with the old carbonate method, because the carbonate requirement changed with the SiO_2 content. With the new method the optimum lime content is automatically obtained. Under these conditions no serious changes of cement properties could be stated within a wide range of SiO_2 content.

Fig. 1 shows three proportioning points. The first proportioning is done before the crusher. One crusher is fed with pure limestone, the other one with alternating loads of limestone and shale. The purpose is to obtain a ratio of approximately 1:1 for the following main proportioning point, for the feeders for this second proportioning point work best with a medium output. They are not so reliable with extreme small quantities of sticky shale which sometimes would occur. These feeders are adjusted every hour according to the analytical results and are locked up for the rest of time by the chemist.

The third proportioning point consists of one scale which records and counts the mill input, and two accurate proportioning scales to weigh the small additional percentages of iron ore and sand. These scales are adjusted according to the complete clinker analysis. There is no need for frequent adjustment.

Theoretically, it would have been possible to combine proportioning points 2 and 3 by installing one more proportioning scale. Practically this was not possible in this special case because several old storage silos for crushed stone had to be used and neither silo could have been provided with a proportioning scale.

The scales feed into a small mill bin which holds a reserve of 15 minutes supply for the mill. This does not mean that the material takes 15 minutes to flow from the proportioning point to the sampling point immediately after the mill. The time interval is considerably shorter since the material which enters the bin last leaves it first. The holding time in the air-swept mill, Loesche-system, is so small that it may be ignored. When hard quartz material was used in combination with soft limestone, the mill content was enriched with quartz and stability was obtained within about 15 minutes.

Scales and feeders are adjusted for an output slightly higher than the mill input. They are automatically switched on and off by the bin level.

The idea of the whole arrangement is to reduce to a minimum the time between the proportioning point and the sampling point. This time plus the time required for analysis represents the correction lag. The more this lag can be shortened the more the size of the blending system which follows can be reduced. A smaller blending system is cheaper not only in its first costs but also in the current costs for moving material during the homogenizing process.

The raw mix sample has to be a composite sample for proportioning purposes. It is drawn by an automatic sampler. Uniformity of the raw mix is checked by intermittent sampies taken at the kiln entrance.

The blending system shown in Fig. 1 consists of twelve silos. Eleven silos feed together into a screw conveyor, reducing the average deviation. One-third of this raw mix goes to the storage silos, 2/3 is blended with the raw meal coming from the mill and reduces its deviation before it enters the twelfth silo. The outlet of this silo is closed during the filling operation. The silo is filled completely in one operation. During this interval the next silo will be completely empty and will be filled and so on in turn.

The practice not to feed into a silo before it is entirely empty and to fill it completely in one operation is important to utilize the full blending capacity of the system. The reason will be understood by considering the other extreme to feed one silo after another in short intervals. In this assumed case there would be the situation shown in Fig. 2 instead of the normal situation of Fig. 3. It has been mentioned before that the material on top of the silo leaves it first as shown in Fig. 4. Therefore, the material on the bottom of the silos in Fig. 2 which never are entirely emptied, would not participate in the blending process but would represent a dead zone. Smaller blending silos and separate storage silos could be used as well for this purpose. It would be even better because it would prevent any wrong ideas about the blending effect which varies with the representative content of the blending system. Separate storage silos proved indeed very desirable because there is always a need to vary the storage. Handled properly, the blending silos are always kept at an average content of half the overall capacity, as shown in Fig. 3. This guarantees a uniform blending.

What should be the minimum amount of raw mix participating in

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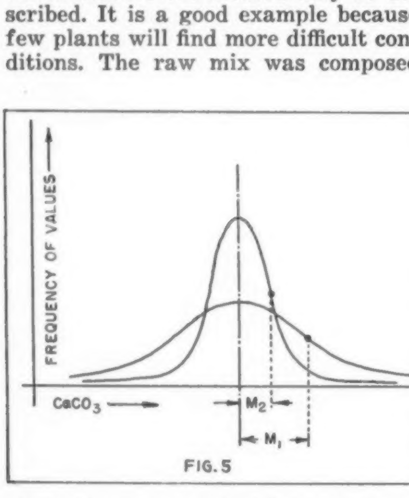

Fig. 5: Curves to show how thousands of analyses have been mathematically evaluated by comparing the mean square deviation of intermittent samples M_1 before and M_2 after blending

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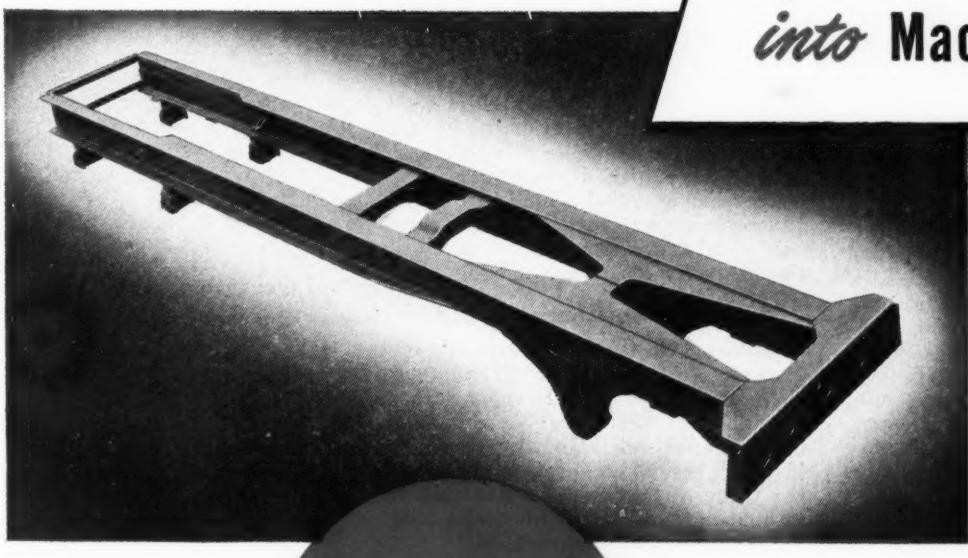

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Mineral Aggregates Featured At A.S.T.M. Meeting

Specifications are becoming more difficult to meet. Gypsum and lime problems discussed

By NATHAN C. ROCKWOOD

BRIEF SUMMARIES of 14 chapters of a forthcoming *Symposium on Mineral Aggregates* were among the features of most interest to readers of ROCK PRODUCTS at the annual convention of the American Society for Testing Materials, Detroit, Mich., June 21-25, inclusive. The contributors to this Symposium were selected for their especial knowledge in each of the subjects included, covering the nature, production, processing, testing of and specifications for mineral aggregates to serve every purpose.

The Society published a similar symposium in 1929, copies of which have long since ceased to be available. Moreover, in those 20 years a great deal has been learned about aggregates, particularly the character and behavior of concrete aggregates; and, as producers know, great strides have been made in processing to produce the kind of aggregates demanded by constantly increasing restrictions on quality, size gradation, and other specification requirements. The present Symposium was conducted under the chairmanship of PROF. K. B. WOODS, Purdue University, who is chairman of Committee C-9, of A.S.T.M. on Concrete and Concrete Aggregates.

Distribution of Aggregates

K. B. WOODS, himself, opened the session with a paper on the "Distribution of Mineral Aggregates". This describes the geographical distribution of rock, sand, gravel and slag, with some details in regard to their geological origin and character. The author divides the United States into regions "each of which has a reasonable continuity of construction-material types as well as similarity of material characteristics. * * * These regions represent areas in which such factors as specifications, methods of test, source of supply and engineering use of constructional materials are directly related to the region in question and not necessarily related to any other region". Coming from an engineer with the consumer's point of view, this is important recognition of the fact that an aggregate that would be rejected in one part of the country may be the best that another part can produce, and hence must be used for economic reasons regardless of shortcomings.

The author has done a good job in the limited space available of cataloging the various mineral aggregates by regions. The northern belt of states which has been covered by glaciers, of course, in general has the best sand and gravels, as well as the most extensive and continuous deposits of limestone and dolomite. The distinction is drawn between materials deposited by streams from melting glaciers of the Ice Ages, and those deposited by washes from mountainsides, which constitute most of the sand and gravel deposits of the Southern, Rocky Mountain and West Coast States. Rivers carry the material from these mountainside washes out on to the Great Plains States, and provide the chief sources of aggregate in river beds and overflow plains.

The bedrock regions of the United States are described. This information is valuable to the producer and prospective producer not only in limiting his choice of raw materials, but in furnishing a clue, with other geological and geographical factors, to the character of the sands and gravels that may be available. For the benefit of readers or students who wish to pursue the subject in more detail the author has supplied a bibliography of 129 references to text books and state geological survey reports, which is unusually complete and valuable.

Petrographic Characteristics

RODGER RHODES and RICHARD C. MIELENZ, U. S. Bureau of Reclamation, contributed a paper, not yet available, on "Petrographic and Mineralogic Composition of Aggregates," in which special emphasis is placed on the value of petrographic analysis in estimating the value of rocks and sands as concrete aggregates. It will be recalled that the Bureau of Reclamation has long been an exponent of the theory that certain aggregates react with free alkalies in portland cement to cause disintegration of concrete structures. This theory has gained many converts in the last few years, and has served to throw suspicion on many commercial aggregates which have hitherto been used without question in important structures for many years.

In general the chemical reaction between particles of aggregate and portland cements containing more than about 0.6 percent of sodium and/or potassium oxide appears to be between the opaline silica content of the aggregate and the alkali. According to petrographic analyses (polarizing microscopic tests), opaline forms of silica are widely distributed in nature as binders in all kinds of rocks and gravels. Hence, it is necessary to study the structure of mineral particles to determine whether the opaline silica exists in sufficient quantity to make the aggregate undesirable for use in any particular instance.

The physical properties of a mineral aggregate which affect its value as an ingredient of concrete are: (a) porosity, permeability and absorption; (b) surface texture; (c) volume change with wetting and drying; (d) thermal properties; (e) strength and elasticity; (f) specific gravity; (g) hardness; (h) particle shape; (i) coatings. The chemical properties which are important are: (a) solubility; (b) reactivity (1) oxidation, (2) reactivity with components of cement, (3) alkali reactivity; (4) base exchange capacity. Those who have followed developments in concrete research have heard most of these discussed pro and con for several years. The "thermal properties" angle is coming to occupy a greater place in specifications, because of a new theory of "incompatibility of aggregates." In other words since the coefficients of expansion of limestone and quartz, for example, are quite different, there has come a theory that limestone coarse aggregate should not be used in concrete in conjunction with natural siliceous sands. We are to hear a great deal more about this in the near future.

The paper contains various case histories of concrete structures which are held to have deteriorated because of reactivity between aggregates and cements. Any relatively fast volume change in hardened concrete has long been recognized as a destructive influence, whether caused by changes in temperature, wetting and drying or freezing and thawing. When these more common causes of volume change apparently failed to account for concrete deterioration after several years' exposure, it was discovered that while they were accessory factors, the real cause of failure was laid to a chemical reaction which resulted in the for-

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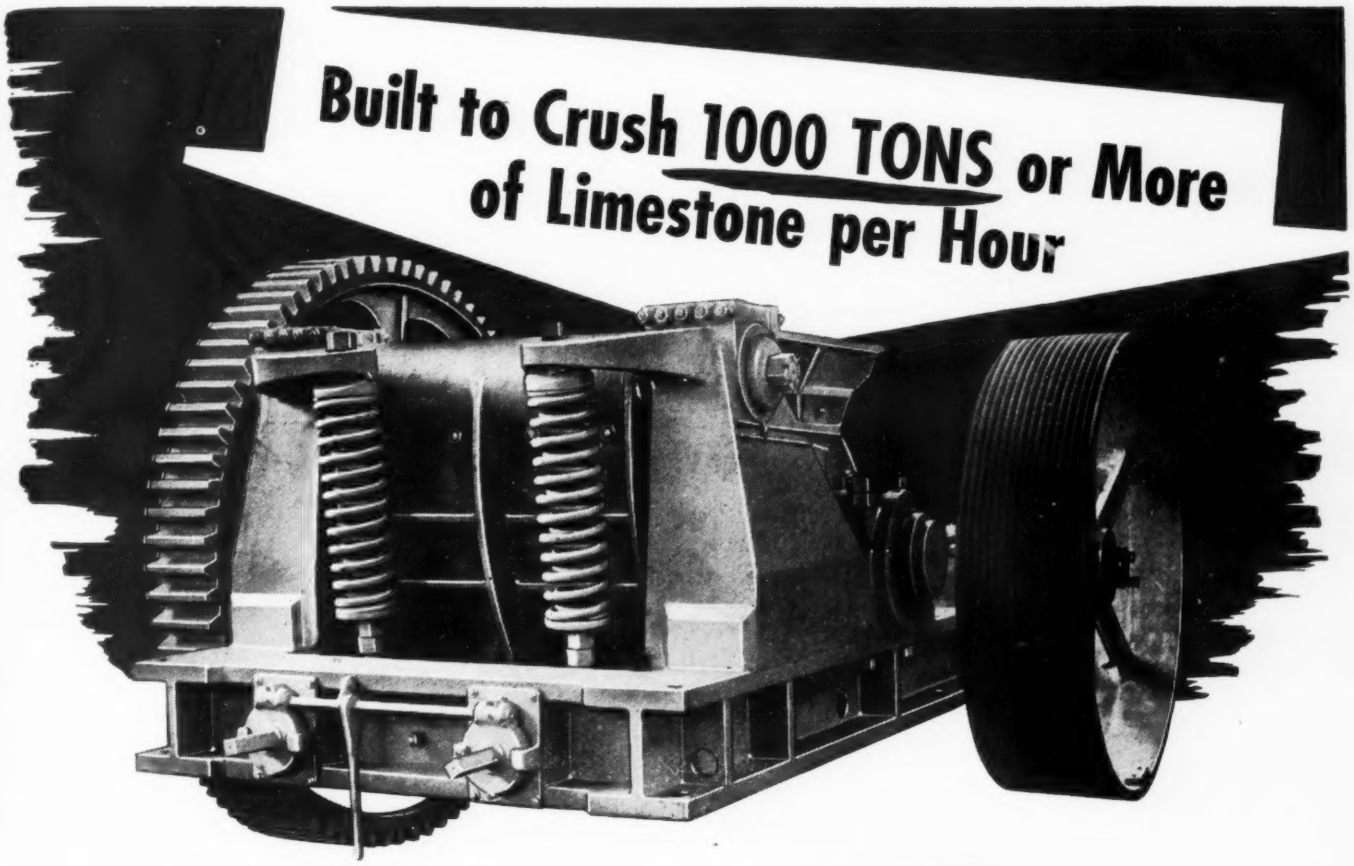
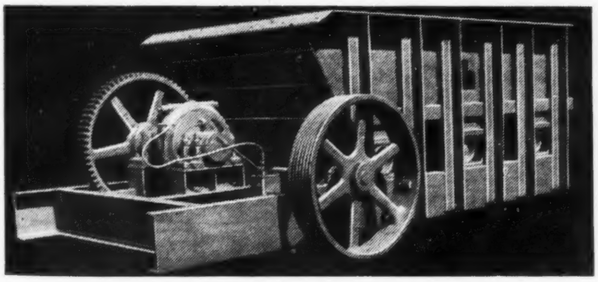
Built to Crush 1000 TONS or More of Limestone per Hour

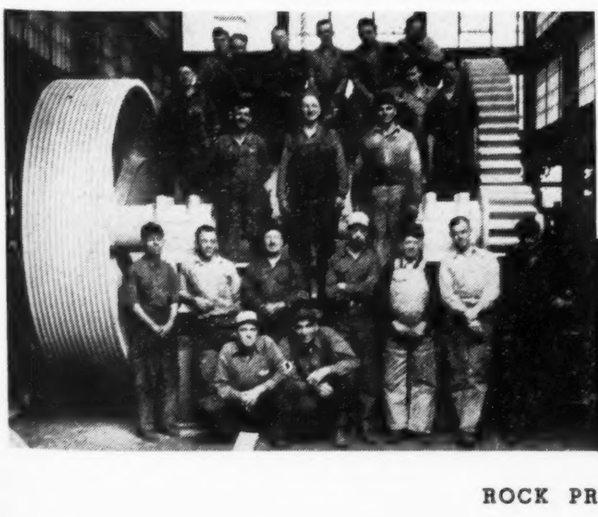


McLANAHAN *BIG HEAVY DUTY* ROCKMASTER CRUSHER



★ Illustrating the McLanahan Feeder designed to operate as a component part of the Big Heavy Duty Rockmaster Crusher. It is fed by 18 to 20 ton Euclid trucks.

★ Graphically showing the tremendous size of this Big Heavy Duty Rockmaster Crusher, just before it was dismantled for shipping to a huge limestone operation in Maryland.



Way back in 1912 McLanahan designed and built, what was then considered an unusually large crusher for Eastern Limestone Crushing—it has been continuously in successful operation. When the need developed for an even larger Crusher—this dependable service-performance record was the deciding factor in again choosing McLanahan equipment. Designed for a normal crushing capacity—1000 tons or more per hour from 8" to 10" sizes. For the economical solution to any crushing problem—get the McLanahan facts.

[redacted]

mation of silicate gels in the pores and cavities of the concrete, resulting in destructive osmotic pressures.

Physical and Chemical Tests

DR. HAROLD S. SWEET, joint Highway Research Project, Purdue University, had for his subject "Physical and Chemical Tests and Their Significance," a paper which is not as yet available. It covers a scholarly historical resumé of the various developments in the testing of aggregates, with a comprehensive compilation of present standard acceptance tests, and the significance of test results. These are summarized under separate sections relating to the specific test being discussed.

Under heading (1) are tests for deleterious substances which are grouped as follows: (a) Material finer than No. 200 sieve; (b) organic impurities; (c) coal and lignite in sand; (d) clay lumps; (e) shale. (2) Tests for mortar strength; (3) soundness tests (salt crystallization); (4) freezing and thawing tests; (5) abrasion tests; (6) hardness, toughness, and unit weight (slag). Those cover the usual acceptance tests.

Besides these are what the author describes as standard informational tests, which include: (1) Unit weight; (2) specific gravity—(a) apparent, (b) bulk, (c) bulk (saturated surface-dry); (3) absorption; (4) chemical analysis. Classified as "investigational tests" are (1) elastic properties; (2) volume change; (3) mineralogical analysis — (a) lithological count of pebbles in gravel, (b) hardness tests (scratch test), (c) microscopic analyses; (d) chemical analysis; (4) porosity and permeability—(a) absorption, (b) true specific gravity, (c) microscopic analysis, (d) dye penetration, (e) permeability; (5) "simulated service tests"—(a) stripping of bituminous films, (b) mortar-bar test for alkali-aggregate reaction, (c) wetting and drying of concrete beams, (d) freezing and thawing of concrete beams.

This paper ends with a summary of the present status and suitability of aggregate tests in general. Having read this far, the producer reader may conclude that at least the engineers, professors and researchers have learned how to specify the perfect aggregate, but such is not the case. It seems they are just about as much at sea as to how to make lasting concrete out of the narrowing field of choice aggregates as ever.

Sampling Aggregates

CHARLES E. PROUDLEY, chief materials and test engineer, North Carolina State Highway and Public Works Commission, contributed a paper on "Sampling Mineral Aggregates." Mr. Proudley has the benefit of several years' experience as assistant to Stanton Walker, director of engineering, National Sand and Gravel Association, so he is not devoid of an understanding of the producers' point of view, as often happens with materials research engineers. He began with a warning that accuracy in sampling is of equal importance to accuracy in testing—a point frequently overlooked by testing engineers. Consequently, there is no substitute for careful observation and the exercise of good judgment on the part of the one taking the sample, to be sure of getting a truly representative sample.

This paper is concerned primarily with sampling the finished products to determine their qualities for meeting specifications. Included is investigation of the source of raw material where the rock or gravel is not homogeneous. From such an investigation and study some estimate may be made of the percentages of various kinds of rock encountered. These observations are for determination of the general quality of the aggregate. It may prove to contain too large a percentage of poor grade materials for processing. Obviously it is the kind of sampling and testing a producer should do, or have done for him, before he invests his money in development and plant.

Sampling for tests of quality in combination with other materials is the next step in the sampling of aggregates. This means selection of samples for tests of fine and coarse aggregates intended to be used in portland cement concrete and bituminous mixtures. The quality of the end product rather than of the aggregates alone is what it is desired to know. For such test samples it is necessary that they be representative not only of the structural quality of the aggregates but also of the size gradation. The paper contains specific instructions regarding the places to take samples, the size of the sample, etc. Samples taken from the flowsheet in different parts of the plant are helpful to the operator, but the purchaser is interested only in the product being shipped.

Mr. Proudley mentions the fact that it is not possible for a product of a plant to remain uniform under all conditions, and therefore samples should be taken frequently enough to indicate the rate and amount of variation. This frequency will vary, he says, with (1) uniformity of product; (2) the size of quarry blasts; (3) frequency of change of location of digging operations in a sand and gravel deposit; (4) rate and constancy of flow of aggregate through the crushing and screening plant; (5) washing operation as the material passes through the plant; (6) method of handling the aggregate after it leaves the plant; (7) size of the units shipped to the purchaser; (8) method of handling the aggregates at destination.

Screen analyses will naturally vary because of the manner in which the product is handled in leaving the plant and at the job site. According to the author, there is more apt to be segregation of particle sizes when the material goes through bins than when it is loaded out directly from the processing equipment. He points out that shipment of segregated material is not just cause for rejection if means are provided later for remixing it. If the sampler is aware of the segregation and assures himself that the necessary sizes are in the shipment, there are various methods of adequate mixing the segregated materials before use.

Evidently from the uncontrollable desire of a purchaser to tell the plant operator how to operate, Mr. Proudley goes into considerable detail as to how and where to sample the product in the course of its progress through the plant. Nevertheless, such information will prove useful to the plant operator, especially so since this control phase of plant processing is merely touched upon in the following paper on production techniques. In fact all of Mr. Proudley's paper will prove helpful to producers, although written primarily for the benefit of the testing engineer and his sampler.

Methods of sampling stockpiles and railroad cars in transit are described. Where a loading crane is available, the author recommends sampling with the clamshell bucket so as to get a sample more nearly representative of the material below the surface and nearer the center of the carload. In loading cars he recommends that a swinging spout on the end of the chute be used in all instances. It is very difficult to obtain a fair sample of a carload unless the method of loading it is known, for on that method will depend the location of the fine and coarse materials, and a sample of either will not be representative on the whole.

Mr. Proudley recognizes the responsibility of the sampler to both the purchaser and the producer. He concludes: "Should either producer or purchaser doubt the accuracy of the sample being representative, the discussion [of the problem of sampling] should have convinced the reader that there is usually room for reasonable doubt, and additional samples should be taken with representatives of both producer and purchaser present." He concludes: "It is in the best interests of all concerned that the sampler be trained and experienced in his work"—familiar with aggregate processing, testing and with the use of the aggregates in construction, so as to be able to weigh his judgments.

Production and Manufacture

NATHAN C. ROCKWOOD, editorial consultant, ROCK PRODUCTS, summarized so far as possible in a single brief paper or chapter, the primary steps in the "Production and Manufacture of Fine and Coarse Aggregates," beginning with mapping and exploration of

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the deposit. In briefing his paper at the meeting he said that at least it had the distinction of being perhaps the only A.S.T.M. paper he had heard or had read in the last 30 years which did not concern itself with quality or specifications. It was assumed that the producer or prospective producer had satisfied himself on these points before investing his money. Unfortunately some don't, and any reader of this Symposium, when it is published complete, will certainly find that "there is many a slip twixt the cup and the lip."

Since the processing of rock, slag, gravel and sand is familiar to readers of this journal, we will not take space here to abstract the paper, other than to say that it does contain in brief form a summary of modern practice, with sufficient specific information to be useful to plant operators. The author concluded that while the paper was necessarily brief, it was hoped that it would serve to prove that the aggregate industry has indeed become a manufacturing operation capable of a fair degree of scientific control; that there are, however, still partly unsolved problems in the elimination of some deleterious materials, such as "flats" and "soft" particles, the separation of sound from unsound cherts, etc. All these problems of production must be considered by specification writers to prevent calling for materials that can not be produced on a commercial scale with any equipment now available.

Bituminous Construction

Jewell R. Benson, Bureau of Reclamation, had for his subject "Grading of Aggregates for Bituminous Construction." This is a comprehensive discussion divided into two main parts: (1) general considerations such as the functions of aggregates, including fillers, in bituminous mixes, and the sources and kinds of materials available; and (2) typical gradings or particle-size analyses determined to have most satisfactory results. The function of mineral aggregates in a "flexible" type bituminous pavement is of course more exacting than in a rigid type portland cement concrete pavement, since stability in the bituminous pavement is largely a matter of accurately graded particle sizes, including mineral filler material which is generally defined as particles passing a No. 200 sieve.

Aggregate gradings for bituminous construction are comonly specified by two methods: (1) as cumulative percentages passing or retained on each of the standard sieves used in the sieve analysis; or (2) as separate percentages retained between adjacent sieves. These are readily convertible one into the other as the following example illustrates:

Sieve No.	Percent Passing
⅜-in.	100
No. 4	96
No. 8	83
No. 16	62
No. 30	38
No. 50	17
No. 100	2

The same analysis may be expressed with equal accuracy as separate percentages between adjacent sieves as follows:

	Percent
Passing ⅜-in., retained on No. 4 sieve	4
Passing No. 4, retained on No. 8 sieve	13
Passing No. 8, retained on No. 16 sieve	21
Passing No. 16, retained on No. 30 sieve	24
Passing No. 30, retained on No. 50 sieve	21
Passing No. 50, retained on No. 100 sieve	15
Passing No. 100 sieve	2
	100

The distinctions between various kinds of bituminous construction, and why they call for different particle size gradations are described in some detail. Included are tables of a number of aggregate gradings designed for specific types of bituminous construction, and a bibliography dating back to "The Modern Asphalt Pavement," by Clifford Richardson (1904). Incidentally, most of that author's techniques have never been much improved upon.

Concrete and Mortars

Walter H. Price, Bureau of Reclamation, summarized a paper, not yet available, in which are discussed "Grading of Mineral Aggregates for Portland Cement Concrete, and Mortars." Divided into five sections the paper is designed to cover such subjects as (1) reasons for separating aggregates into size fractions, with explanation of the customary terms used; (2) current grading specifications for state and national organizations; (3) effect of grading on the properties of fresh and hardened concrete; (4) economic considerations—with an example of how a small change in grading may amount to millions of dollars in extra cement cost in large dam construction; (5) effect of air entrainment on grading of aggregates; (6) gradings for miscellaneous types of concrete construction.

As most producers know, the Bureau of Reclamation has probably been more fussy about gradation of both fine and coarse aggregates than other construction agencies. Aggregates for a great deal of its construction are produced by a contractor or producer subcontractor near the site of the dam or other structure, so that it is frequently feasible to waste large quantities of less desirable sizes in order to obtain almost theoretically perfect size gradation. The commercial producer on the contrary usually has to find some kind of a market for practically everything his plant turns out. Hence, while producers will find Mr. Price's paper interesting we mistrust that some of his ideas may be difficult to apply in commercial practice. For example, he made the statement in his extemporaneous remarks that it pays to spend one dollar a cubic yard on plant screening to obtain proper size grading—that might be the saving in the cost of cement. But, very few constructors at the present time appear willing to pay a dollar per cubic yard more than the current prices for such graded materials.

Strength and Durability of Concrete

C. W. Allen, research engineer, Ohio Highway Department, contributed a chapter on "Influence of Mineral Aggregates on the Strength and Durability of Concrete," which covers some of the same ground as the previous papers. Durability of concrete, as considered in this discussion is confined to consideration of the resistance of concrete to (1) normal weathering action; (2) chemical reaction between the cement and the aggregates; (3) fire; and (4) the action of salts used for ice control. Included in his discussion are not only the quality of aggregate particles, but the effect of grading on the density and therefore durability of concrete.

It appears to this reporter that the chief value of Mr. Allen's paper is in the opinions expressed, by an expert, regarding the evaluation of an aggregate accurately by any of the usual tests. One point of general interest because it provides an answer to a question frequently asked is this: "Numerous investigations have been made to determine whether the benefits obtained with air entrainment will offset the detrimental effects of aggregates having poor service records. The present indications are that entrained air will not, as a rule, entirely overcome the detrimental effects of poor aggregates. In many instances the improvement is great, in others only slight."

Another interesting point brought out in this paper is the feasibility of blending some good aggregate with that known to have a bad service record. Thus, "with a substitution of 20 percent aggregate with a good service record, durability of air-entrained concrete can be increased by about 30 to 50 percent in addition to that accomplished by air entrainment alone, according to investigations made by the Highway Materials Research Laboratory of the Kentucky Highway Department." Mr. Allen concludes: "Surveys in Ohio have shown that particle shape of the fine aggregate has a marked influence on the degree of surface scale. Field performance surveys have often enabled authorities to modify their specifications for materials and construction practices to obtain more durable concrete at little or no increase in cost."

Lightweight Aggregates

Profs. Raymond E. Davis and J. W. Kelly, University of California, prepared a paper on "Lightweight Aggregates" and lightweight concretes, which will be especially helpful to the

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concrete products readers of ROCK PRODUCTS. It is an excellent summary of the whole field, with considerable information on methods of manufacture of the aggregates, which for want of space were not included in the previous paper on "Production and Manufacture of Fine and Coarse Aggregates." The characteristics of these manufactured aggregates and the concretes made with them are discussed as to unit weights, grading, specific gravity, strength, absorption, workability of the mix, shrinkage, elasticity, durability, thermal conductivity, fire resistance and relative economy.

The types of aggregates described are pumice, cinders, expanded clay or shale, processed diatomaceous shale, processed volcanic glasses (perlite, obsidian, etc.), expanded vermiculite; expanded slag. Proportioning and manufacture of lightweight concrete are treated briefly. Together with a short but comprehensive bibliography, this paper should prove very helpful to both producers and users of this type of aggregates.

Bituminous Construction

J. T. PAULS and C. A. CARPENTER, Public Roads Administration, treated their subject a little more broadly than the preceding chapter on "Grading Aggregates for Bituminous Construction," and it deals with such details as strength and toughness of the aggregates, particle shape, porosity, resistance to film stripping as well as gradation of sizes. Under grading are some helpful data on blending to attain the densest possible mix with various size combinations.

Included is some interesting information on the use of dust fillers. They are used only when the requisite density of the mix can not be obtained without their inclusion, but they should not be included when the voids they will occupy should be reserved for the bituminous binder. Some sands are so nearly of uniform particle size that they can not be used successfully without filler. The authors give an example of bituminous-sand roads in Nebraska, where the "blow sand" is practically uniform in size with natural dust contents of from 2 to 5 percent. A stable surface could not be maintained. But with the addition of 10 to 30 percent of minus No. 200 sieve dust, a satisfactory pavement resulted. This chapter is interesting and helpful because it describes similar examples based on experience.

Low-Coast Road Material

EDWARD A. WILLIS and JAMES A. KELLY, JR., Public Roads Administration, presented a paper on "Mineral Aggregates for Low-Cost Roads and Water-Bound Macadams," which covers a broad field of highway construction materials. Included are crushed stone, slag, gravel sand-clay and sand-clay-gravel mixtures, top soil, disintegrated granite, chert, limerock (the soft kind such as found in Florida), caliche, volcanic cinders, shale, and mine tailings. The chief requirement in the use of any of these materials is that the mixture have the necessary stability when placed on the road.

The paper contains a review of state highway specifications for materials to be used in this type of highway surfacing which should prove helpful to producers in compounding saleable products of material now being wasted. Such mixtures as those described are used not only for surfacing low cost roads, but as base courses for higher types of pavement. We know of several producers who have worked up special mixes of stone screenings, pea gravel, coarse sand, dust, clay and silt for such purposes and found ready and profitable markets for them.

This suggestion is born out by the authors of the paper who conclude with the observation: "Too often the producer of mineral aggregates has ignored the low-cost road field, considering it an unprofitable market for his product. True, much of the low-cost mileage must be built from locally developed aggregate sources. It is believed, however, that there are many instances where an astute and discerning producer could turn to his advantage the increasing activity in secondary highway construction. Thus he might find a ready market for excess and waste sizes."

Railroad Ballast

A. T. GOLDBECK, engineering director, National Crushed Stone Association, summarized briefly the functions of railroad ballast and the nature of the forces the ballast is designed to resist. Ideas regarding the kinds of ballast to fulfill the requirements, and the methods of placing it in the track have changed from time to time, and the author brings these experiments and experience to date. He concluded: "Much remains to be learned about the qualities to be desired in ballast and how to specify and test those qualities in the laboratory. In the last decade there has been a trend toward smaller sizes; engineers have investigated the possibility of making the ballast anti-fouling, and perhaps simultaneously transforming it into a waterproof cover for the subgrade. These trends in the future may well result in a revision in methods for testing ballasts and in specifying them."

Some quotations the author makes from a bulletin of the American Railway Engineering Association are of interest to producers. These are to the effect that stone from the same quarry often varies in tamping experience; that the percentage of breakage and dust made varies with the method used in tamping; that pick-tamping is the hardest on the ballast material; that the Los Angeles rattler test is a practical and convenient method for quick-testing the quality of a ballast material.

Processing Industries

DR. HERBERT F. KRIEGE, technical director, The France Stone Co., Perrysburg, Ohio, would like to see the term "aggregates" extended, as the subject of his paper indicates, to include: "Mineral Aggregates in the Chemical and Processing Industries and in Certain Other Uses"—including agricultural limestone. A part of his paper consists of arguments and statistics to prove that these other uses of limestone are quite as important to the producer of aggregates, as the products he makes in the same plant with the same processing under the more restrictive definition of "Mineral Aggregates" heretofore used in Committee C-9 of the A.S.T.M.

Dr. Kriege's paper represents a careful and accurate summary of such uses for mineral aggregates as flux stone (for metallurgical purposes), mineral wool, alkali production, filter bed media, agricultural limestone, riprap, sugar stone (beet sugar industry), refractory manufacture, glass manufacture, calcium carbide manufacture, stone dusts for various purposes (fillers, animal feeds, paints, dusting coal mines), roofing granules, for pulp and paper manufacture. It is difficult to find elsewhere such a comprehensive summary in brief form.

Needed Research

D. O. WOOLF, Public Roads Administration, concluded the Symposium you have been reading about up to this point, with a brief paper entitled, "Needed Research." The writer of this report can't help thinking that the concluding paper might better have dealt with how to get more practicable results from some 40 years' of research that has gone before. However, Mr. Woolf does deal in a practical and hard-headed manner with some of the things that haven't been learned from research, and he does suggest a review of existing data in an effort to coördinate through a central agency the vast amount of piece-meal research, and to analyze these data to some useful end.

He did believe, and there are getting to be more like him, that much more use can be made of expert knowledge of geology and mineralogy in predicting the lasting qualities of aggregates and concretes made from them. This means coöperation with such agencies as the Geological Survey, the Bureau of Mines and similar agencies in the various states. So, the "needed research" is not so much along the presently familiar lines by materials testing engineers, as by their contemporary scientists in allied fields, who, it would appear, have not hitherto been consulted to the extent they might have been.

(Continued on page 171)

Portland Cement

Committee C-1 on Cement, F. H. JACKSON, chairman, held one of its best attended meetings, with reports by practically all its various subcommittees. However, there was nothing of any very great interest to report to readers of this journal. There is current interest in the durability of masonry cements as well as portland cements, and a subcommittee is at work developing specifications for natural cement. Some revisions were made in the Tentative Specifications for Portland Blast-Furnace Slag Cement. These developments are of significance as at least slight indications of a growing interest in other kinds of hydraulic cements than straight portland cement.

The use of air-entraining agents is broadened by permitting the cement manufacturer to deal with the manufacturer of the air-entraining agent, without the special subcommittee having to pass on the particular material. The only requirement is that the quantity used meet the specification requirements, and the air-entraining cement meet the regular specification requirements for such cements.

All of the officers of Committee C-1 were reelected for another two-year term. They include: F. H. Jackson, senior testing engineer, Public Roads Administration, chairman; W. H. Klein, Lawrence Portland Cement Co., vice-chairman; and Geo. E. Warren, vice-president, Southwestern Portland Cement Co., secretary.

Lime

Committee C-7 on Lime, PROF. WALTER C. VOSS, chairman, reported progress in the work of several subcommittees. The scope of this committee has been enlarged to include industrial and agricultural *limestone*. So far, the committee has arrived only at tentative definitions of limestone for these purposes. The present officers of the committee were reelected for another two-year term. R. S. Boynton, general manager of the National Lime Association, is secretary. The problems of using and specifying hydrated dolomitic lime are still being argued at considerable length, both in and out of the committee.

A new contribution on the subject has been prepared by DR. C. L. CLARK, department of chemistry, University of Illinois; DR. RALPH E. GRIM, Illinois State Geological Survey; ROBERT S. SPRAGUE, graduate student, University of Illinois, and W. W. SPRAGUE, National Mortar and Supply Co. It concerns the use of the Richardson thermo-chemical method of analysis of hydrated and partially carbonated lime. It is concluded that this method offers a more accurate way of determining whether or not the magnesium oxide of dolomitic limes hydrates after a period of time, than the chemical methods proposed by the A.S.T.M.

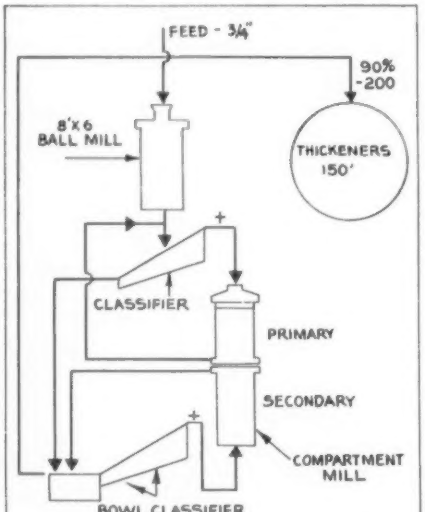
Committee C-11 on Gypsum, DR.

(Continued on page 173)

Multiple Grinding Mills

(Continued from page 143)

through 1¼-in. grate openings. The screen analyses of the feed, primary rake product, and the primary clas-



Rawgrind flowsheet

sifier overflow are given in the following tabulation:

RAW MILLS (+) * Ball Mill	— (36 - 38 tons per hr. Primary Rake	110 - 125 bbls. per c.e. per hr.) Primary over-flow
3/4		
3 1.5	5.5	
4 1.3	1.3	
8 2.5	2.7	
14 4.5	5.1	
28 18.5	20.0	.3
48 22.6	31.4	3.9
100 13.9	19.5	17.5
200 8.3	6.1	19.9
—200 26.9	8.4	58.4

*All screen readings are (+) or that retained on the screen.

RAW FEED TO BALL MILLS +	
1½-in.	2.99
1¼-in.	8.72
1 -in.	6.55
¾-in.	11.28
½-in.	7.55
⅜-in.	6.40
¼-in.	5.03
4 M	4.71
8	6.55
10	3.55
14	4.32
20	5.86
28	6.05
35	5.55
65	7.40
100	.90
200	2.99
—200	3.78

Three kilns are operated by the Calaveras Cement Co. The newest, which went into service about two years ago, is an 11-ft. 3-in. x 350-ft. Allis-Chalmers unit, originally fabricated for the Manganese Ore Co., Las Vegas, Nev. Oil and gas are both used for fuel, with gas being used for the major part of the time, but at certain periods of the year, gas pressure gets low and kilns are then fired with oil.

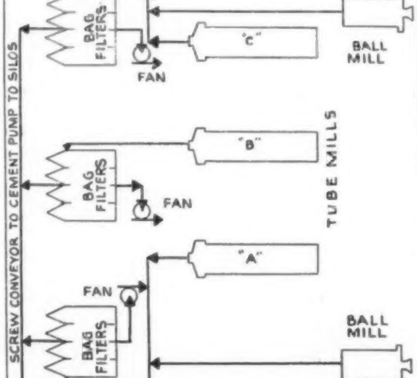
Slurries are now handled by Wilfley pumps, replacing the previously used pressure-type, or "Monte Ju", air-operated ejectors. The plant uses Fuller-Kinyon pumps to a high degree with air being supplied by Fuller rotary compressors. Additional Cottrell electrical precipitators are used for kiln dust recovery. Manufacture of white Portland cement has been discontinued here temporarily as the requirements for ordinary Portland cement are taxing production.

The general aim of the company, according to A. A. Hoffman, consulting engineer for the Calaveras Cement Co., is to increase the finish grind and the clinker storage section. In this manner, if business falls off raw production can be easily reduced, and clinker grinding carried out on day schedules that would fit into the sales volume.

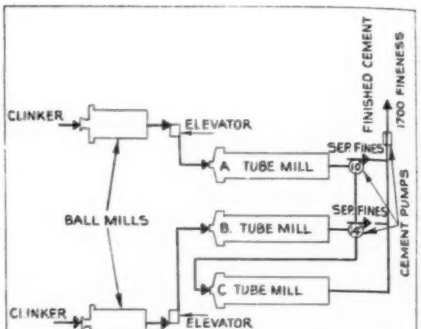
Quarry Operation

In the quarry a new 5-cu. yd. Bucyrus-Erie, 120-B, electric shovel has just recently been placed in service. A feature of the quarry is the use of 40-ton capacity dump trucks. These trucks do not use the State highways but are confined to the company's own roads. There are four Autocar diesels equipped with Gar Woods steel bodies with oak lined bottoms covered with a ¼-in. steel wearing plate. The truck bodies are in dual sections with each body holding a net 20-ton load, each, or a total of 40 tons. These bodies side dump to a 65 deg. angle and function through double-action drum hoists that are cab-controlled. They have a 144½-in. wheelbase and 53-in. gauge.

Official personnel includes: William Wallace Mein, president; H. C. Maginn, vice-president and chairman of the operating committee; William Wallace Mein, Jr., vice-president; A.



Dust control system on finish mill flowsheet



Finish mill flowsheet

A. Hoffman, consulting engineer; J. Tedesco, secretary; J. B. Smith, treasurer; G. W. Mein, purchasing agent; Geo. A. Jarrett, public relations manager; E. M. Barker, superintendent; M. Sutton, chief chemist; M. S. Heard, assistant superintendent; Evan Hall, mill foreman; and L. Allsman, quarry foreman.

Quarry Cement Safety

THE OVER-ALL ACCIDENT PICTURE in industry is improving, according to the National Safety Council. The 1947 industrial injury rates, released in advance of the 1948 edition of "Accident Facts," show a better safety record than the year before, the Council states.

In the cement industry, 7.23 disabling injuries per 1,000,000 man-hours are reported, while the quarry industry had 17.05 disabling injuries for the same number of man-hours. The cement industry lost 2.82 days per 1000 man-hours, and the quarry industry lost 3.69 days per 1000 man-hours.

Chemist Corner Erratum

K. J. SCHATZLEIN, JR., author of "Nomographs For Determining Air Content of Cement Mortars" which appears on pages 130-131 of the June, 1948, issue of ROCK PRODUCTS calls attention to the following corrections: The part of the heading in the first colume, page 131, "For Untreated Cements" should appear just ahead of the second to last paragraph of that section which begins, "Maximum and minimum values of 250 and 200 ml. water, etc." All discussion prior to this paragraph concerns treated cements. The third line, third paragraph of the section on application should read,

$$2W \cdot \frac{(182.7 + P)}{(5000 + 10P)} = 100 - \%\ \text{air}.$$

Under Step 4 of the application, the negative characteristic of the logs has been omitted. The second line should be,

$$m_v = \frac{10}{\bar{2}.64355 - \bar{2}.62284}.$$

Under Step 9 of the application a typographical error was made in the word "plot."

A. S. T. M. Meeting

(Continued from page 171)

L. S. Wells, National Bureau of Standards, chairman, L. H. Yeager, secretary, made a very brief report, including a withdrawal of the standard specifications for calcined gypsum for dental plasters and for gypsum pottery plaster, for the reason that purchasers have their own specifications and pay no attention to an attempted common standard. Some tentative revisions were made in the standard specifications for gypsum plasters. Dr. Wells was reelected chairman and C. E. Abbey was elected secretary.

Building Stones

In view of the current discussion of methods for determining the durability factors of concrete aggregates and concrete, a tentative method of test for the "combined effect of temperature cycles and weak salt solutions on natural building stone" may have some interest. It is much less severe than the salt solution tests applied to aggregates, and apparently is designed to serve the same end in determining the resistance of rock to weathering and other disintegrating forces of nature. The test is for absorption and volume change in 30 cycles of wetting and drying in a solution of gypsum and water.

Technical Papers

Only a few of the many technical papers presented, besides the symposium on mineral aggregates, appear to be of any great interest to Rock Products readers. Among these was one by C. C. Conner, New Jersey Bell Telephone Co., long an active member of Committee C-7 and a brick and mortar expert. The title of his paper is "Factors in the Resistance of Brick Masonry Walls to Moisture Penetration"—a perennial subject for discussion by manufacturers of mortar materials. The conclusions in this paper are the result of investigations of 100 existing buildings, subject during construction to variables of individual workmanship, weather conditions, and all the other variables normal to field work. The ages of the buildings vary from 6 to 23 years.

Aside from special attention to construction details, Mr. Connor found that the use of mortars with a lime content equal to or greater than 50 percent of the volume of cement, with brick having a rate of absorption between 5 and 25 g. of water, when set flat side down in ⅛-in. of water for 1 min., gave satisfactory results. There was no conclusive evidence that the kind of lime used was a factor. The mortar used should have high water retentivity and this is one of the virtues of a high limed mortar.

Reactive Aggregates

In addition to the discussion of aggregate minerals which react with

(Continued on page 174)

certain kinds of portland cement, as a part of the Symposium on Mineral Aggregates, already abstracted above, two West Coast highway engineers who have long been writing about their experience, contributed additional data in two short papers. These were "Correlation of Laboratory Tests with Field Experience," one by THOMAS E. STANTON, California Division of highways and the other Bailey Tremper, State of Washington Department of Highways. W. C. HANNA, California Portland Cement Co., objected to Mr. Stanton's naming the cements used by brand names, because he said he had found the same brands to vary widely in alkali content from year to year, or even in shorter periods.

Mortar-bar expansion tests seem to be the most satisfactory tests to date. The abstract of Mr. Stanton's paper, given by PROF. R. E. DAVIS, consisted of lantern slides showing some badly disintegrated concrete. BAILEY TREMPER'S paper also contained some illustrations of bad concrete. He concluded: "The service records of these structures, embodying, as they do, examples of both high- and low-alkali cements, indicate a high degree of correlation with results of laboratory tests.*** All the tests indicate that the aggregate is reactive in high-alkali cement. Among these (tests), only the freezing and thawing test and the mortar-bar expansion test indicate the observed fact that when used with low alkali cement, a high degree of permanence can be expected from the concrete made with the aggregate even though it is exposed to severe weathering conditions."

Subsequent discussion tended to substantiate that 0.6 percent of sodium and/or potassium oxide is the top limit for low-alkali cements. The point was raised that many aggregate minerals are much higher in alkalis than cements, but Mr. Hanna expressed the opinion that alkalis in the aggregate did not have the same significance in the concrete as the alkalis in the cement.

Value of Petrography

Two papers, one by R. C. MIELENZ and L. P. WITTE, Bureau of Reclamation and the other by BRYANT MATHER, Corps of Engineers, U. S. A., both emphasized the value of petrographic analysis in identifying the reactive constituents of concrete aggregate. When done by an expert it is said to be possible to form a fair estimate of the opaline silica present, and this appears to be the bad actor in most instances.

We know of one instance where the Corps of Engineers has rejected a sand which has been used in concrete construction with satisfactory results for many years, because a petrographic analysis showed a small percentage of chalcedony, which is said to be in silica grains bonded with opal. We may expect to hear a great

deal more about this test in the near future. One fact should not be overlooked. The analysis (with a polarizing microscope) is made on such very small samples that it would seem the chances for error are also very great.

At another general session, M. F. Hasler, C. E. Harvey and F. W. Barley, Applied Research Laboratories, experts in the use of spectrochemical analysis of metals, explained how these equipment and methods could be applied to analysis of cement and other mineral products. They gave some data on results of analyses of portland cement by this method as compared with those of the usual chemical analyses. Apparently, spectrochemical analysis has some possibilities as a manufacturing control.

D. O. Woolf and T. R. Smith, Public Roads Administration, described a fairly rapid test with mortar filled, sealed glass jars containing a small amount of water. If in 30-days the mortar has not expanded sufficiently to crack the jars, it was found that the aggregate was not reactive enough to be harmful. However, there are some aggregates that react so slowly as to require 100 days' time. There was found to be a big difference in the time required to crack the jars, depending on the temperature of storage. Much less time was required at 100 deg. F. than at 70 deg., which means apparently that the reaction is primarily a puzzolanic one (one involving combination of the lime and silica).

Effect of Delayed Mixing

Walter H. Price and John W. Robinson, Bureau of Reclamation presented a paper on "Effect of Delayed Mixing of Prefabricated Moist Aggregates and Cement on the strength and Durability of Concrete." This is a matter of more interest to the engineer and construction contractor than to the aggregate or ready-mixed concrete producer, since it concerns relatively long haulage of batched materials (not mixed or agitated in transit). The moisture in the aggregates, of course, reacts in some measure with the cement. The conclusion was that the durability of the concrete, as measured by freezing and thawing tests, is improved as the interval between batching and mixing is increased up to about two hours.

It is quite appropriate to wind up this report with reference to a paper by Dr. Harold S. Sweet, joint Highway Research Project, Purdue University, on "Research on Concrete Durability as Affected by Coarse Aggregate." The Indiana State Highway Department officials are engaged in intensive study to find the causes of some unfortunate experiences with concrete pavements. Dr. Sweet reviewed experiences and methods of testing aggregates, and concluded that the freezing and thawing test was a fair one, but not infallable. There seems to be a limiting pore size in minerals which is an important factor in durability.

Waste-Chasing Transportation

(Continued from page 159)

Another accident cause is typified by the operator who was loading gypsum on a conveyor belt with a scoop truck. He backed over an embankment that was unprotected by bumper timbers or curbing, causing the machine to tip over backwards upon him. He lost 84 days on account of a fractured hip.

Industrial truck operators should be carefully selected and thoroughly trained in traffic rules and safe vehicle operating practices. Speed should be regulated, operators should face in the direction of travel and never back up without looking. There must be competent and thorough maintenance, including daily inspections of all controls, moving parts, wheels, brakes and signaling equipment. Horse-play and stunt driving should not be tolerated, and trucks should be locked when they are left unattended.

High Cost, High Hazard

Bad handling means high cost as well as high hazard. The possibilities of mechanization should be tested whenever a man has to lift anything from his feet to a point over his head, has to lift more than 50 lbs. from his feet to his shoulders, has to lift more than 100 lbs. from his feet to his waist, or has to lift more than 150 lbs. from his feet to his knees. The same test should be made where a man has to stand in one place steadily moving material for over 30 minutes, and where a man or a group have to move more than 10 tons of material per hour although moving in a small radius.

If handling and allied problems are studied with care, improvements usually can be made that will reduce both costs and accident hazards.

War Plants Put On Stand-By Basis

SEVENTEEN war plants, among 60 listed by the House Armed Services Committee as essential to the defense of the country, have been put on a stand-by basis through a law signed by President Truman. These include: New England Lime Co., Canaan, Conn.; Diamond Magnesium Co.; Painesville, Ohio; Dow Chemical Co., Freeport, Tex.; Dow Magnesium Corp., Velasco, Tex.; and Permanente Metals Corp., Manteca, Cal.

Pavement Yardage

AWARDS of concrete pavement for the month of June and for the first six months of 1948 have been announced by the Portland Cement Association as follows:

	Square Yards Awarded During June 1948	Square Yards Awarded During First Six Months 1948
Roads	2,127,701	13,166,616
Streets & Alleys	2,886,913	9,717,548
Airports	190,365	931,246
Totals	5,204,979	23,815,410

Labor Relations

(Continued from page 89)

railway or highway while in use as such.

In our researches in connection with the Schroeder Co. case, we came across another, which should be called to the attention of the industry, for it is more clear-cut and decisive. The case we are referring to now is Walling v. Pueblo Sand and Gravel Co., decided March 10, 1945, by the U. S. District Court, Denver, Colo. In this case the sand, gravel and ready-mixed concrete producer was supplying a large manufacturer of steel products for shipment in interstate commerce with construction materials and with a sand for use in connection with the steel company's blast furnaces. Incidentally the judge (Symes) is the same one who recently decided that the Labor-Management Relations Act does not apply to construction laborers in Denver because local construction does not *affect* interstate commerce. Now we may speculate as to why Mr. Denham brought his first construction industries case before this judge—see ROCK PRODUCTS, June, 1948, p. 125.

In the Pueblo Sand and Gravel Co. case, this judge said: "The activities of the workmen in question, while in one sense logically necessary if attached to a link in the long chain of causation, would lead to absurd results not intended by Congress, nor required under a statute so general in its terms. It would violate the common-sense and independent interpretation of the Act enjoined upon the lower courts. Nor are we confronted with one of the situations that gave rise to the legislation. The activities of the defendant [producer] are not indispensable to the production of steel at the Fuel [and Iron] company's plant and, as pointed out, the participation of the employees in question is very remote.

"Clearly Congress did not intend to regulate every step in the chain of causation however remote that might be linked to the Fuel company's interstate business. Furthermore, the defendant's product did not become an ingredient of the goods produced for commerce. What is needed is something of that common-sense accommodation of judgment to Kaleidoscopic situations which characterize the law in its treatment of causation.

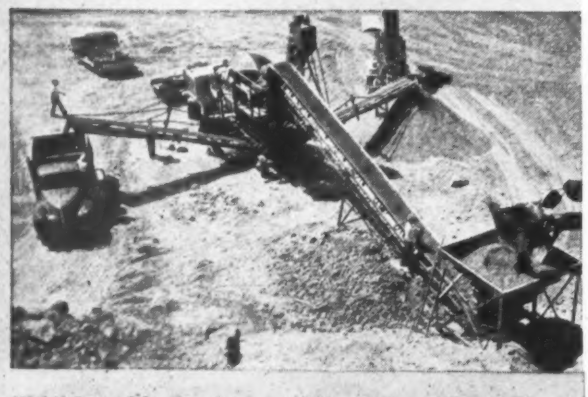
"If the Act reached the activities in question, the commerce power [of the U. S. Constitution] alone would support regulation of any local action, since such activity, however remote, affects commerce, or is necessary to the production of goods for commerce." Evidently, this judge is not in sympathy with the desire of Washington bureaucrats to extend their authority over all the activities of life, and in view of this decision we can better understand his denial of Mr. Denham's petition for an injunction under L.-M.R.A., as reported in ROCK PRODUCTS, June, 1948, p. 125.

Making Little Ones Out of Big Ones

WITH A-W PORTABLE PLANTS

Two-Unit Portable Crushing and Screening Plant.

"101" Portable Crushing and Screening Plant.



"81" Portable Crushing and Screening Plant

Austin-Western Portable Crushing and Screening Plants are built in sizes and types to fit every production requirement.

Under certain conditions, Multiple-Unit Plants are recommended because of greater operating flexibility and lighter transport weight. These Two- and Three-Unit Plants are primarily suited for producing large quantities of material, and if desired, several sizes may be produced at one time.

Shown at the left are two of many Single-Unit Plants—the "101" with its 10 x 36 Jaw Crusher and 30 x 18 Roll Crusher, and the "81" with its 10 x 36 Jaw Crusher.

All Plants are equipped with matched Screens and Conveyors, correctly balanced to deliver the maximum amount of crushed and screened aggregate in controlled sizes. From the smallest Single-Plant—and there are many smaller than those pictured on this page—to the magnificent Two- and Three-Unit combinations, every Austin-Western Portable Plant is "engineered for low-cost tonnage."

AUSTIN-WESTERN COMPANY, AURORA, ILL., U. S. A.

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859

Change Cement Pricing

(Continued from page 148)

portland cement will have the slightest effect on increasing the amount of cement shipped into New Mexico. The only thing that can relieve our shortage of cement in New Mexico is increased production at mills within shipping distance, or the establishment of a cement mill within the state. As you know, the Ideal Cement Company is nearing completion of its new mill at Portland, Colorado, which is the location from which it ships into New Mexico. The new mill will have an annual capacity of approximately 1,500,000 bbls. of cement. New Mexico will not get the full capacity of this new mill, however. If we assume that New Mexico will receive one-third of the output of this new mill, we would have an increase of 500,000 bbls., but it must be remembered that many mills which used to ship into this area have discontinued shipments due to shortages within their own area and due also to the terrific increases in freight charges. Will our share of the new production from Colorado offset cement which is no longer available from other sources? We do not know.

"To give you an idea of how badly our State's demands are out of balance with production, we list New Mexico's cement consumption as follows:

Average annual use			Percent
1935-1944	603,752	bbls.	100.00%
1945	827,429	bbls.	137.05%
1946	1,075,994	bbls.	178.21%
1947	1,107,150	bbls.	183.38%

"In the first 3 months of 1948 New Mexico's usage was 19.62% above the same period in 1947. If that prevailed throughout the year 1948, consumption would reach 1,324,373 bbls. which would be 219.36% of the 10 year average 1935-1944. Production of cement at the mills serving this territory has not increased in the same ratio, and with an acceleration of government work in White Sands, Los Alamos, and Albuquerque areas, it is quite likely that our supply of cement will continue short or shorter.

"It is suggested that you try to plan your work so that you can pour as much concrete as possible during the months of January, February, and March as cement is usually more available during those months.

"We regret that cement shortage has hampered our customers, but we are doing our best, and will continue to do our best, to serve you as promptly as possible."

New PCA Laboratories

THE PORTLAND CEMENT ASSOCIATION has awaraded a cost plus fixed fee contract to Turner Construction Co. for the building of research and development laboratories at Skokie, Ill., an Association release states. The project will involve an expenditure of some $2,000,000.

Europe's Cement Practices

(Continued from page 155)

clinker is of minor interest in Europe than in America, because most European raw materials are very low in magnesia content.

Firing

For coal preparation the old-fashioned rotary drier with subsequent grinding mill has been abandoned in practically all modern cement plants and substituted by mills for simultaneous drying and grinding.

The unit firing system is used at some plants in Europe, but most plants prefer the bin system, because it makes the kiln less dependent on the mill operation and offers better grinding economy. These factors are undoubtedly of more importance in Europe than in America, because most European plants must be prepared to treat coal of greatly varying quality, and often of very low grindability. For the same reasons, mills of the airswept ball mill type are generally preferred to high-speed mills.

During the war it was necessary to use inferior coals, often of a quality having 9000-10,000 B.t.u. per lb. only and a moisture content of 12-15 percent. Coals from old refuse dumps as well as lignite with 3200-6500 B.t.u. per lb. and more than 30 percent moisture were used at some plants. In countries with peat bogs, as for instance Scandinavia, an admixture of peat was resorted to, the peat containing 3200-6500 B.t.u. per lb. and 25-45 percent water. For instance, in Denmark a kiln was operated a couple of years with 30-40 percent of the B.t.u.'s in the fuel consisting of peat. For some time this kiln was even successfully fired with peat alone, but the output was decreased. The peat was disintegrated and ground in a Tirax mill and finally dried in a flash dryer.

At the burner's platform of the more modern European cement plants is provided a combined coal mill and kiln control panel equipped with instruments for centralized control (Fig. 8).

Cement Grinding

The general practice in Europe is to take the clinker from the clinker storage direct to the cement mills without crushing. Some plants use a clinker jaw-crusher for crushing to about ½-in. maximum size. At a few plants a cone crusher is used for a somewhat finer crushing.

In some plants the primary grinding takes place in a ball mill or Kominuter, and the finish-grinding in a tube mill, but compound mills such as the Undian mill (Fig. 9) are most commonly used. The largest Unidan mills installed for cement grinding are up to 8 ft. 6 in. by 60 ft. and have a power consumption of about 1600 hp. One such mill grinds conveniently the output of one of the largest kilns.

(Continued on page 184)

European Practices

(Continued from page 183)

Quite contrary to the American practice, the European cement mills are rarely operated in closed circuit with air separators. When the installation of such a closed-circuit system has been considered, it has generally been concluded that the higher first cost is not warranted by the operating advantages. The overall grinding economy is not considered materially better than for open-circuit grinding, at least when the question is of grinding portland cement to ordinary fineness.

In this connection it may be mentioned that the various national standards for cement in most European countries do not specify as high a fineness as in the United States.

With regard to the question of cooling the cement mills in order to reduce the cement temperature and to avoid coating of the mill lining and charges, it is a common practice to spray the mills externally with water. This method has in several cases caused serious corrosion of the mill shells. Many attempts have therefore been made to substitute the outside water cooling by internal water spraying of the mill, but not until recently has a successful solution of the various problems involved been developed. This special system is now installed in many Unidan Mills, and besides reducing the cement temperature, the water spraying has acted as successful grinding aid.

Cooling and Transport of the Cement

When the cement leaves the mill, its temperature is usually ranging between 200 and 300 deg. F, and even after relatively long storing in a cement silo there will be no substantial reduction in temperature. As such high temperatures are detrimental to the paper bags in which the cement is packed it is therefore desirable to have the cement cooled before it is taken from the mill to the cement storage.

A cooler used for this purpose in Europe consists of a vertical cylindrical tank at the bottom of which the hot cement is introduced (Fig. 10). On the inside of the cylinder there is an agitator that distributes the cement in a thin layer on the cylindrical wall and at the same time moves it upwards in a spiral path to an overflow at the top. Cooling water is sprayed on the outside of the tank. The coolers are generally arranged for cooling the cement down to about 120-130 deg. F.

In Europe the cement transport was already before the war most frequently pneumatic and over longer distances effected by such conveyors as the Fuller-Kinyon or Fluxo pumps (Fig 11). Over shorter distances in a slightly downward direction a Fluxo conveying channel may be used. This is of the pneumatic type that was de-

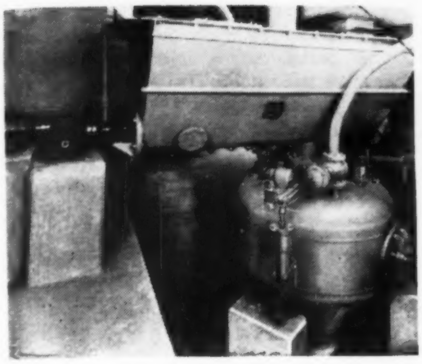


Fig. 11: Fluxo cement bump

veloped shortly before the war and that uses fluidization of the cement by compressed air supplied through porous surfaces in the bottom of the covered trough through which the transport takes place.

Cement Packing

One of the most widely used packers in Europe is the Fluxo Packer (Fig. 12), which consists of a rotating tank in which the cement is fluidized by means of compressed air. The tank is provided with a number of filling spouts, 3 to 14, according to the required capacity of the packer. The valve bags are placed on the spouts by a single operator whose job is confined to that task only. During one revolution of the tank the bag is automatically filled, weighed and discharged. On a 12 spout packer, an individual operator is, according to skill, able to fill 1500 to 2300 bags of 94 lbs. (42.5 kg.) per hour.

European cement is packed almost exclusively in paper valve bags, but loading in bulk on railroad cars and in ships is gaining ground.

Types of Cement

As previously said, it is not the practice in Europe to grind the ordinary Portland cement to as great a fineness as is common in U.S.A. The normal fineness in Europe ranges around 95 per cent passing 170 mesh sieve, corresponding to a surface area of 1400-1500 sq. cm/g according to the Wagner Method.

In addition to portland cement many plants manufacture high-early strength cement, and in special cases low-heat cement and sulphate-resisting cement is made.

Blended cements were used to some extent in Europe before the war, for instance in Denmark, the Moler cement, which reminds of the American puzzolan cements containing active silica has been used for sea water construction for about 40 years, and old concrete breakwaters of this cement in the North Sea have stood up excellently.

Blended cements with blast furnace slag or other slag materials were made already before the war in the iron-producing districts of Belgium, France and Germany.

In order to economize on the scarce fuel supply, the use of blended ce-

ments increased highly during the war, and the above-mentioned admixtures with active silica found still wider application. In other countries blended cements with inert admixtures such as quartz and limestone played an immense role. The quality of the last mentioned types of cement varied, however, much within the different countries. Some were made simply by grinding ordinary portland cement clinker together with a certain quantity of sand or limestone, while others were made by a special process of finely ground highlimed cement clinker and ground admixtures, mostly quartz sand, resulting in a cement fully comparable to ordinary portland cement with respect to strength.

In this type of blended cement the portland cement constituent is found in the finer particle size range, and the admixtures in the coarser, the admixtures thus filling out the gap in particle size between that of the cement and that of the aggregates. The various blended cements are still extensively used in Europe.

Proportioning Portland Cement Raw Mixtures

(Continued from page 162)

the blending process? There must be time for one plus deviation swinging back to minus deviation until it has been compensated. But it is better to have a multiple of such a period. Results will become better as more deviation periods occur within the blending stock. In planning the size of blending silos, it must be taken into consideration that there are also other deviations than those in the lime content which is regularly controlled in short intervals. There may be deviations of other components which are not under such regular control.

Many years of research have been spent to determine the best method of homogenization. Thousands and thousands of analyses have been mathematically evaluated by comparing the mean square deviation of intermittent samples M_1 before and M_2 after blending (Fig. 5). The method described above has proved the best for the dry process. It was preferred to the mixing of two analyzed silos in a calculated ratio. The latter method would be reasonable only if the content of each silo were homogeneous. It should be restricted to the wet process.

Efforts have been made for many years to develop a method for homogenizing single raw meal silos by compressed air similar to the wet process. The air was blown in through nozzles or porous plates or both. The efficiency and blending velocity of some tests were surprisingly good. Much encouraging data were obtained before the tests were interrupted by the war. The method may possibly compete in the future with conventional methods after some initial difficulties have been settled and a final comparison of handling costs will be possible.

Manufacturers' News

Brooks Equipment and Mfg. Co., Knoxville, Tenn., manufacturers of materials handling equipment, has appointed David S. Price as general manager, according to an announcement by E. N. Brooks, president. Mr. Price was management consultant engineer of Chicago before his appointment.

Nordberg Mfg. Co., Milwaukee, has appointed R. R. Schultz as sales manager of the crusher and process machinery divisions. Mr. Schultz joined the company in 1938 as sales engineer and served a year in the Canadian branch office at Toronto. He was promoted to assistant sales manager in 1946. He was formerly associated with the Traylor Engineering and Manufacturing Co., Allentown, Penn. Mr. Schultz attended the University of Cincinnati and Colorado School of Mines, receiving a degree in metallurgical engineering from the latter school. He is a member of the American Institute of Mining and Metallurgical Engineers.


R. R. Schultz

Harrington & King Perforating Co., Chicago, Ill., announces the appointment of David K. Colesberry as general sales manager, according to an announcement by Foye P. Hutchinson, president. The 65-year old perforating firm has long been recognized as a leader in the perforating industry and in the pioneering of process applications and ornamental uses for perforated materials. Mr. Colesberry was formerly with the Sharples Corp., centrifugal and process engineers, Philadelphia, Penn., and is well known in the industrial field throughout the country.


David K. Colesberry

Dravo Corp., Pittsburgh, Penn., has appointed Wilson C. Blake Co., Hartford, Conn., as distributor of "Counterflo" heaters in Connecticut and western Massachusetts.

Thew Shovel Co., Cleveland, Ohio, has announced the appointment of Dell W. Savage as Eastern sales manager, with headquarters in New York, N. Y., for the territory covered by Metropolitan New York, Long Island, New York State, northern New Jersey and Connecticut. Robert T. Maynard, formerly export manager for the Osgood Co., will succeed Mr. Savage as Mid-Atlantic sales manager, with headquarters in Washington D. C. His

territory covers eastern Pennsylvania, southern New Jersey, Maryland, Virginia, North Carolina, and the District of Columbia. Joseph F. Beles has been named sales manager of the North Midwest territory with headquarters in Milwaukee, Wis., for the territory embracing Wisconsin, Upper Michigan, Minnesota, North and South Dakota, Montana, Wyoming, and Colorado.

International Harvester Co., Chicago, Ill., has announced two new operations in Springfield, Ohio, in addition to its Springfield Works on Lagonda Avenue. The export packing section at the Springfield Works will be transferred to a newly purchased building at Sheridan and Belmont Avenues, and assembly of some engines and machining of some parts now carried on at Indianapolis Works will be transferred to a company-owned building on East Pleasant Avenue. Both new operations will be under the direction of A. H. Scherer, works manager, Springfield Works.

Milwaukee Industrial Marketing Association, Milwaukee, Wis., has announced a "Directory of Milwaukee Industry," prepared by N. H. Jacobson, press relations chairman, as a first step in a program to improve relations between Milwaukee industry and the business and technical press by enabling business news editors to reach authoritative sources of information quickly and easily.

Hewitt-Robins, Inc., Buffalo, N. Y., has announced the appointment of Charles W. Mackett as manager of sales operations for the Hewitt Rubber Division. He was formerly assistant sales manager of the division.

R. G. LeTourneau, Inc., Peoria, Ill., has appointed Harry R. Powers as Eastern sales manager, succeeding E. M. Ferguson who has resigned. Mr. Powers is a veteran of over 23 years' experience in construction equipment sales and service. He has been district sales representative since his discharge from the U. S. Engineers in 1945, in which he enlisted and served as supervisor of maintenance operations in the 363rd Special Service regiment, instructing Iranian and Russian officers in care and use of heavy equipment.


Danforth K. Heiple


Harry Powers

Danforth K. Heiple has been promoted to chief field engineer. He succeeds R. C. Lewis, who has resigned. Mr. Heiple was graduatd from Purdue University in 1941 with a B.S. degree in Mechanical and Civil Engineering. During World War II, he joined the Naval Aviation Engineers where he served for a time as officer in charge of service and maintenance of aircraft aboard the U.S.S. Enterprise. When he was discharged in 1945 he joined LeTourneau as field engineer.

Mack Trucks, Inc., New York, N. Y., has announced the appointment of C. F. Larsen as manager of general service and C. A. Slifer as assistant, with headquarters at the Plainfield, N. J., plant. George McCall has been named manager of service engineering with offices at the Long Island City, N. Y., plant.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., recently held open house at its Cleveland steel-service plant which has been expanded to include new offices and a large addition to plant capacity. It is now considered the largest plant of its kind between New York and Chicago devoted to the distribution of steel from stock.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the appointment of Harold T. Anderson as assistant to the general sales manager, in charge of sales production relations, with headquarters at Harrison, N. J.

MacWhyte Co., Kenosha, Wis., has appointed W. Howard Minton as direct factory representative for the Gulf Coast area, with headquarters in Houston, Texas.

Bemis Bros. Bag Co., St. Louis, Mo., has announced the retirement of Reuben H. Brown as manager of the New Orleans plant. However, he will remain in the service of the company as special representative. Mr. Brown will be succeeded as manager at New Orleans by H. J. Wehrenbrecht who has been assistant manager there since 1943. A new sales office has been opened in Cleveland under the direction of Neely J. Leake, assisted by Robert C. Thomas, sales representative, and Miss Dorothea Haggerty who is the Cleveland office manager.

"Quick-Way" Truck Shovel Co., Denver, Colo., built the 5000th Model E "Quick-Way" truck shovel on April 1 of this year, which marked a 29-year milestone in the history of truck mounted power shovels. The design of the shovel was originated in 1919 by Luke E. Smith, now president of the company, and was built for mountain road construction in Colorado. Howard H. Reynolds is vice-president.

Signode Steel Strapping Co., Chicago, Ill., announces the appointment of Milton C. Carlson as assistant sales manager in control of the field organization. This announcement was made by J. M. Moon, sales manager.

Taylor Forge & Pipe Works, Chicago, Ill., announces that E. (Ed) L. Behrends has joined the general sales department.

St. Regis Sales Corp., New York, N. Y., has elected the following new officers in addition to those already serving: Arch Carswell, executive vice-president; H. W. Sloan, vice-president and director; John F. Gruber and Walter M. Neill, vice-presidents. Directors of Taggart Corp., also a St. Regis Paper Co., subsidiary, have elected W. R. Adams and Willard E. Hahn as vice-presidents and John E. Cowles as comptroller.

E. B. Kelley Co., Farmingdale, N. J., manufacturers of concrete block machines, bins, and related equipment, has announced that the new name of the company will be Witteman Machine Co.

National Carbide Corp., New York, N. Y., has announced the election of J. Carl Bode, formerly operating manager, as president of the company to succeed L. A. Hull who has been appointed chairman of the board of directors.

Detroit Diesel Engine Division, General Motors Corp., Detroit, Mich., has appointed the Earle Equipment Co., Detroit, Mich., as distributor of Series 71 Diesel engines. Jack Deakins, sales engineer, will head the new sales section.

The Dorr Co., New York, N. Y., announces that Dr. and Mrs. John Van Nostrand Dorr, accompanied by their grandson, Burr Hardon, have sailed for Europe to return early in September. Dr. Dorr will attend the meeting of the Society of the Chemical Industry in Edinburgh, Scotland, and will revisit the Dorr associated companies in London, Amsterdam, Brussels, Milan and Paris.

FINANCIAL

RECENT DIVIDENDS

Alpha Portland Cement	$ .25	Sept. 10
Blue Diamond Corp.	.25	July 1
Calif. Portland Cement	1.80	July 24
Canada Cement pfd.	.32½	June 21
Canada Crushed Stone Ltd.	.10	June 19
Colonial Sand & Stone	.10	July 30
Coronet Phosphate Co.	1.50	June 30
Gypsum, Lime & Alabastine	.25	Sept. 7
Gypsum, Lime & Alabastine	.25	Dec. 1
Hercules Cement Corp.	.25	July 1
Kelly Island Lime & Transport Co.	.25	June 30
Keystone Portland Cement Co. $7 pfd. (p75) (arrears)	2.50	June 15
Lone Star Cement	.87½	June 30
Missouri Portland Cement	.50	June 25
National Gypsum Co.	.25	July 1
Pacific Portland Cement pf.	1.62½	July 10
Peerless Cement Corp.	.25	Aug. 16
Penn-Dixie Cement	.25	June 15
Penn Glass Sand Corp.	.40	July 1
Penn Glass Sand Corp. pfd.	1.25	July 1
Permanente Cement	.25	July 30
Santa Cruz Portland Cement	.50	June 15
Standard Silica Corp.	.12½	Aug. 14
U. S. Gypsum Co.	.75	July 1
U. S. Gypsum Co. pfd.	1.75	July 1
Warner Co.	.25	July 15
Whitehall Cement	1.00	June 30

KELLEY ISLAND LIME & TRANSPORT Co., Cleveland, Ohio, has announced a profit for the first quarter of 1948 for the first time in company history. Diversification of business and rail shipments of products to inland steel plants during winter were listed as responsible by Ralph L. Dickey, president of the company.

PACIFIC PORTLAND CEMENT CO., San Francisco, Calif., has called for redemption on October 1, 1948, 17,447 shares of its 6½ percent cumulative preferred stock, or one-half of the issue outstanding, at $142 a share, representing $100 par value, a premium of 5 percent and $37 in accrued unpaid dividends. The shares to be redeemed will be chosen by lot out of the 34,894 shares issued. The company advises stockholders of its intention to retire the remaining 17,447 shares on or before October 1, 1949.

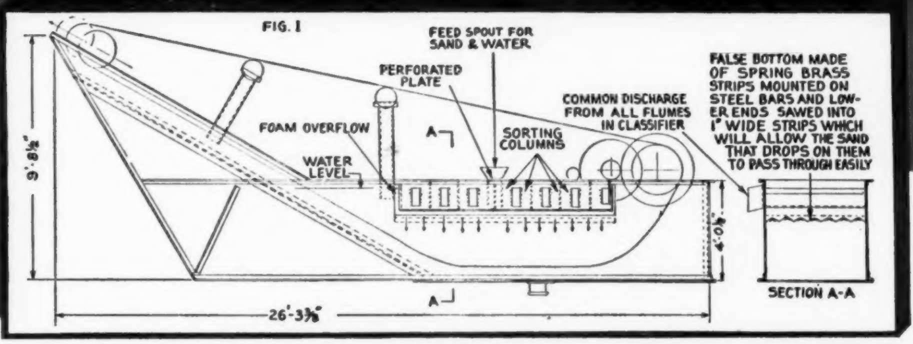
MAULE INDUSTRIES, INC., Miami, Fla., has released the below account of income for the eight month period to December 31, 1947:

Sales	$4,680,898
Costs & expenses	3,834,821
Depreciation	117,742
Depletion	21,915
Operating Profit	706,421
Other income	25,834
Total Income	732,254
Other deductions	62,500
Federal Income taxes	262,492
Net Profit	407,262
Dividends	117,529
Earned surplus, 12-31	289,733
Earned com. share (783,524 shs.)	$0.52

NAZARETH CEMENT CO., Nazareth, Penn., had a net income of $330,882 last year as against $268,121 in 1946. This was equal, after preferred dividends, to $1.76 a share on 154,749 common shares compared with $1.35 in 1946. Net sales in 1947 were $3,326,228.

LONE STAR CEMENT CORP., New York, N. Y., lists March quarter sales at $9,594,705 for 1948, compared with sales of $9,419,773 for the same quarter of 1947. Net profit for the 1948 quarter was $913,736 or $.96 per share as against a net profit of $1,175,239 or $1.24 a share for the corresponding quarter of 1947.

(Continued on page 192)



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Webster offers the following important features:

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- Maximum weir lengths for minimum sorting column area.

*** See articles in the June and September, 1947 Rock Products on the Webster Hydraulic Classifier and proper sand classification.**

Write for complete information

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TIFFIN, OHIO

Sand, Gravel and Stone Handling Equipment

The Williams "SLUGGER" Crusher and Pulverizer

Handles "ONE MAN" Stone • Saves Sledging

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By reducing large rock to $1\frac{1}{4}''$, $\frac{3}{4}''$ or agricultural limestone in one operation, the "Slugger" has enabled operators to produce these sizes at a low cost per ton and with small investment.

Features include—Manganese steel hammers, heavy duty bearings, adjustable breaker plate, hammer adjustments overcome wear, economical to operate.

CUTAWAY VIEW of "Slugger" showing heavy duty hammers, liners and discs.

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PATENT CRUSHERS GRINDERS SHREDDERS

CANADA CRUSHED STONE, LTD., Ontario, Canada, has published the below income account for years ended December 31:

	1947	1946
Operating profit	$ 288,895	$ 217,254
Deprec. and deplet.	81,607	54,072
Net oper. profit	207,288	163,182
Other income	5,737	5,983
Total income	213,025	169,165
Income tax	96,901	83,951
Net profit	116,125	85,214
Dividends	25,496	25,496
Surplus for year	90,629	59,718
Earn. surplus, 1-1	1,003,501	944,520
Credits	12,498	578
Debits	7,300	1,316
Earn. surp., 12-31	1,099,328	1,003,501
Earn., com. share	$1.82	$1.34
No. of com. shares	63,740	63,740

Dividends: Last $0.10 June 19, '48; pd. '48, $0.30.

PENNSYLVANIA GLASS SAND CORP., Lewistown, Penn., lists a net profit of $254,586 or $.67 per common share for the first quarter of 1948 as compared with a profit of $324,740 or $.88 per common share for the March quarter in 1947.

KEYSTONE PORTLAND CEMENT CO., Philadelphia, Penn., for years ended December 31, reports the following account of income:

	1947	1946
Net sales	$3,754,545	$3,086,861
Costs & expenses	2,999,383	2,526,748
Deprec. & deplet.	138,775	131,099
Operating profit	616,387	429,014
Other income, net	21,467	19,067
Total income	637,854	448,082
Pr. yr. group ins.	18,898	....
Income taxes	245,000	178,000
Net profit	373,957	270,082
Preferred divs.	283,410	198,387
Surplus for year	90,547	71,695
Earn. surp., 1-1	577,710	506,015
Earn. surp., 12-31	668,256	577,710
Earn., pfd. share	$13.19	$9.53
*Earn., com. sh.	4.39	1.79
No. of pfd. shares	28,341	28,341
No. of com. shs.	40,000	40,000

*Disregarding preferred arrears.

NEW HAVEN TRAP ROCK CO., New Haven, Conn., on March 31, 1948, had outstanding $450,000 of unsecured 4 per cent notes maturing in 8 years, representing a refunding of long term notes previously outstanding. Under provisions of notes, company is required to maintain working capital of $350,000, and dividends are restricted to 50 per cent of the excess of profits over amortization requirements of notes.

GLENS FALLS PORTLAND CEMENT CO., Glens Falls, N. Y., reports the following account of income for years ended December 31:

	1947	1946
Net sales	$2,714,993	$2,052,458
Mfg., etc. expense	2,234,151	1,758,378
Depreciation	119,001	120,152
Operating profit	361,841	173,928
Other income	3,622	9,313
Total income	365,463	183,241
Bond int., etc.	11,906	19,250
Pensions	5,315	5,086
Doubt. acct. res.	2,000	2,000
Federal inc. tax	132,000	46,000
Net income	214,242	110,905
Preferred divs.	6,000	6,000
Common divs.	81,200	20,300
Surplus for year	127,042	84,605
Surplus, 1-1	787,243	702,638
Surplus, 12-31	914,284	787,243
*Times chg. earn.	30.08	9.15
Earn., pfd. share	$214.24	$110.91
Earn., com. share	5.13	2.58
No. of pfd. shs.	1,000	1,000
No. of com. shs.	40,600	40,600

*Before income taxes.

GIANT PORTLAND CEMENT CO., Philadelphia, Penn., had a net income of $278,148 on net sales of $2,466,241 for the twelve months period ended March 31, 1948, as compared with an income of $184,175 on sales of $2,283,210 for the corresponding period of the preceding year.

AMERICAN AGGREGATES CORP., Greenville, Ohio, gives the following consolidated income account for years ended December 31:

	1947	1946
Net sales	$3,980,791	$3,316,538
Cost of sales	2,375,885	1,970,747
Gross profit	1,604,906	1,345,791
Allied oper. inc.	240,868	325,051
Total	1,845,774	1,670,841
Selling, etc., expense	291,263	275,143
Depr. & deplet.	384,277	301,746
Net earnings	1,170,234	1,093,951
Other income, net	50,919	57,886
Total income	1,221,153	1,151,837
Fed. income tax	456,980	421,935
Net income	764,173	729,902
Preferred divs.	57,638	57,750
Common divs.	375,052	187,526
Surplus for year	331,483	484,626
Earn. surp., 1-1	1,790,707	1,097,819
Contingency res.	....	*cr* 150,000
Credit	11,186	* 58,262
Earn. surp., 12-31	2,133,376	1,790,707
Earn., pfd. share	$66.33	$63.19
Earn., com. share	3.77	3.58
No. of pfd. shares	11,520	11,550
No. of com. shares	187,526	187,526

*Liquidation of Brown Farms Co.

CONSOLIDATED CEMENT CORP., Chicago, Ill., announced the account of income for years ended December 31 as follows:

	*1947	1946
Net sales	$3,373,831	$3,000,720
Cost & expenses	2,732,631	2,448,031
Operating profit	641,201	552,689
Bond interest	34,644	53,212
Bond disc. & exp.	4,386	19,852
Other deductions	8,547	21,673
Fed. income tax	254,000	215,000
†Net profit	339,623	242,952
‡Times chg. earn.	16.21	7.27
Earn. cl. A share	$3.40	$2.42
No. of cl. A shares	99,916	99,916

*Preliminary.

†After depreciation and depletion: 1947, $173,653; 1946, $161,046.

‡Before income taxes.

Correction

THE FINANCIAL REPORT of Permanente Cement Co., Oakland, Calif., for years ended January 31, was given incorrectly in the February, 1948, issue of ROCK PRODUCTS. It should have read as follows:

	* 1948	† 1947
Net sales	$16,308,172	$11,191,584
Cost of sales	11,377,658	8,111,696
Selling, etc., exp.	1,139,418	745,202
Operating profit	3,791,097	2,334,686
Other income	64,259	‡ 202,584
Total income	3,855,356	2,537,270
Interest	62,532	62,935
Aband. loss	147,786	234,213
Other deductions	9,247	66,137
Fed. income tax	1,364,641	836,672
Minority interest	921	....
Net income	2,270,228	1,337,313
Preferred divs.	....	687,168
Common divs.	450,000	....
Surp. for year	1,820,228	650,145
Prev. earn. surp.	2,538,388	1,520,524
Earned surplus	4,358,616	2,170,669
Earn., com. share	$3.24	$1.91

Based on 700,000 shares outstanding Jan. 31, 1948, disregarding preferred dividends paid.

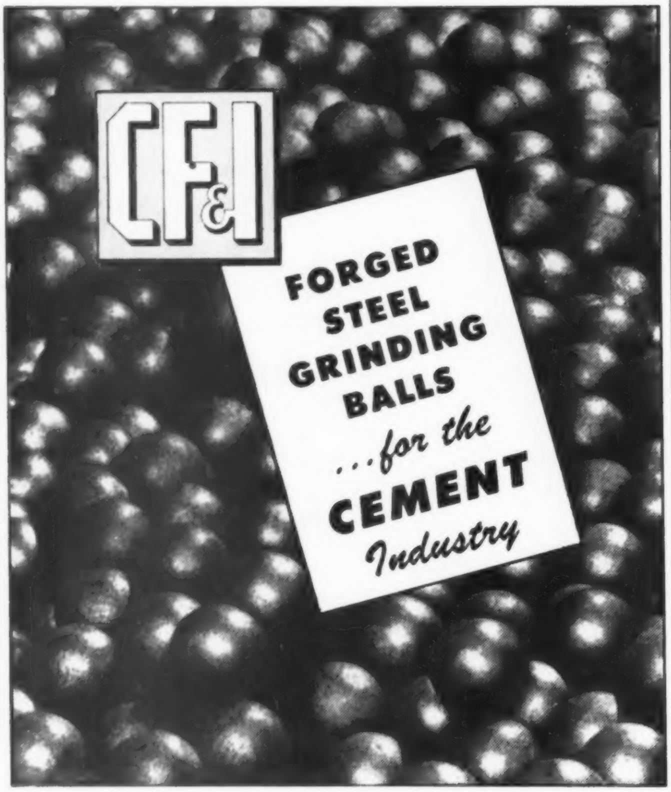
*Includes operations of Pacific Coast Cement Corp. and its subsidiary, Pacific Coast Cement Co.

†From SEC report, and includes Glacier Sand & Gravel Co. for year ended Apr. 30, 1947.

‡Includes $84,413 settlement of claim arising from cancelled sales contracts.

The annual report published by Permanente Cement Co. is an example of excellent layout and photography telling Permanente's story in picture as well as print.

The company last year reached a peak in production sales and earnings, with production listed at 6,100,000 bbls., the report states. Contributing to this total were a 500,000 bbl. increase in capacity at the California plant, and acquisition of the 900,000 bbl. capacity Diamond plant in Seattle, Wash., on March 1 of last year. Henry J. Kaiser is president of the company.



We solicit your Grinding Ball inquiries

The Colorado Fuel and Iron Corporation—long a leader in supplying quality grinding balls to the mining industry—has expanded its production facilities and range of sizes produced to serve the specific needs of the cement industry.

C F & I Forged Steel Grinding Balls are made from new high carbon steel and forged to a perfect spherical shape in sizes from ¼ of an inch to 5 inches in diameter. Manufactured under close metallurgical control for resistance to abrasion and heat treated to assure uniform wearing qualities, they give you low grinding costs.

•

Prompt attention will be given to your inquiries for 1949 requirements.

The Colorado Fuel and Iron Corporation
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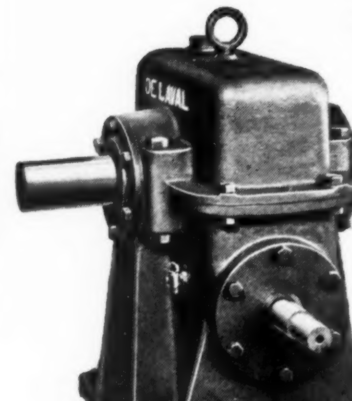

WG-22

These popular units are assembled, crated and ready for immediate shipment.

Reducer	*Ratio*	*Probable *HP Motor*	*Reducer*	*Ratio*	*Probable *HP Motor*
BW400	9⅔	5	BW600	11⅔	10
BW400	19½	3	BW600	19½	7.5
BW400	25	2	BW600	25	5
BW400	40	1.5	BW600	40	3
BW500	11⅔	7.5	BW700	9⅔	15
BW500	19½	5	BW700	19½	10
BW500	25	3	BW700	25	7.5
BW500	60	1.5	BW700	40	5

** Based on 1750 rpm—A.G.M.A. Class 1 Service. For other rpm's or Service refer to De Laval rating tables.*

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New Haven 8-3459
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St. Paul, Minn.
Garfield 1836
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Salt Lake City 3-7933
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TRENTON 2, NEW JERSEY

CONCRETE PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

• Greystone Concrete Products Co., Henderson, N. C., uses mixer truck to pour concrete to septic tank forms

A SECTION OF ROCK PRODUCTS

INDUSTRY NEWS

Asphaltic Admixture For Concrete

HYDROPEL, a new admixture for concrete, has been announced by American Bitumuls Co., 200 Bush Street, San Francisco 4, Calif. A brown, slightly viscous liquid, described as an aqueous suspension of colloidal asphalt, it is designed to reduce water absorption, with subsequent reduction in concrete expansion and contraction; to improve the dispersion of cement; to increase the ability of concrete to absorb shock without breaking; and to afford protection against alkaline or neutral-salt attack and destructive gases.

Hydropel can be poured, or transferred from its storage place by an open impeller type of centrifugal pump. During concrete mixing, the product is substituted for a portion of the water at the rate of 1½ gal. of Hydropel for each sack of cement. For normal mixes, this will take the place of the same amount of water—gallon for gallon.

Bid Calls for Concrete

BID CALLS are expected to be issued soon for work on three western projects. The first, Missouri Basin Project, Mont., a concrete dam and power plant, will call for 430,000 cu. yd. of concrete for the dam and 40,000 cu. yd. of concrete for structures.

Columbia Basin Project, Coulee Dam, Wash., a canal and headworks, will call for 50,000 cu. yd. of ready-mixed concrete, and 136,000 cu. yd. of concrete for structures.

Columbia Basin Project, near Soap Lake, Wash., will invite bids for concrete pipe for low head portion and steel-lined concrete pipe for high head portion, plus 77,300 cu. yd. of concrete and 116,000 bbls. of cement.

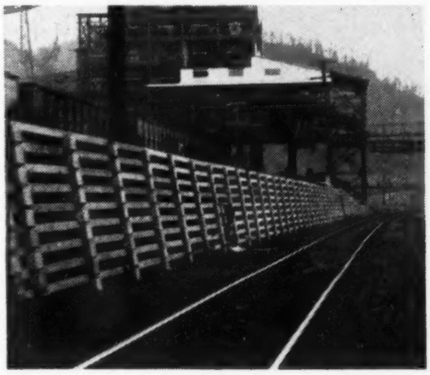
Low Priced Homes From New Masonry Material

TEXCRETE, a new lightweight masonry material, is being used by Texas builders to turn out houses priced below $5000. The product is manufactured by the Texcrete Co., Fort Worth, and is made from portland cement and Haydite. The masonry units are said to be 40 percent lighter than ordinary sand and gravel concrete, have 40 percent greater heat insulation, are 50 percent more sound absorbent, and are incombustible. They are used for walls and partitions.

Oscar A. Seward III and W. F. Shurtleff, Jr., Fort Worth Builders, have already completed models of homes using Texcrete which will sell for $4700 exclusive of lot. FHA has approved the units which consist of two bedrooms, living room, kitchen, bath and hall. The builders have launched a project of 29 houses to be built in Fort Worth and have completed plans for another 400 as soon as the first 29 are built.

Concrete Crib Wall

UNIVERSAL CONCRETE PIPE CO., New Martinsville, W. Va., recently furnished cribbing for a special concrete crib wall at the Consolidated Coal Co.'s Arkwright Mine, Gandeeville, W. Va. The wall ranges between 6 and 15 ft. in height and is 600-ft. long. It supports six railroad sidings for different gradations and sizes of coal.



Concrete Crib wall supports railroad sidings

Foundation for the project was soft and unstable, making it necessary to excavate three feet below foundation elevation and backfill it with river gravel for stabilization. An 8-in. perforated pipe was installed below the heel of the wall to carry off excessive ground water. The crib wall was constructed on a 2-in. to 12-in. batter and backfilled with limestone and river gravel.

Masonry Residence Plan

COLUMBUS CONCRETE BLOCK MANUFACTURERS ASS'N., Columbus, Ohio, has inaugurated a concrete masonry residence plan service for concrete masonry homes to fit local conditions. Columbus architects are designing the plans, first of which was prepared by Louis F. Karlsberger. Known as Plan 1C-A, it calls for a one-floor, two-bedroom expansible home with attached garage, to fit a 40 ft. lot. It will be built by T. Lloyd Fonner.

Artificial Stone

DEVELOPMENT of a new artificial stone, "Nu-Masonry," by H. L. Campeau, Green Bay, Wis., was announced recently in Plastering Industry magazine. A formula of portland cement, lime, sand, water and mineral colors, "Nu-Masonry" is applied over metal or stucco mesh, or over masonry or concrete block. After application the stone lines are hand carved.

•

FORREST BENTON and son, Robert, have established a ready mixed concrete business at Cedar Falls, Iowa.

ELSINORE PUMICESTONE BLOCK CO., Elsinore, Calif., has announced construction of an office room and four-room residence to adjoin the company.

INTERLOCKING BLOCK CO., headed by Duane Harden, has been established at Ashland, Kan.

MARTIN BLOCK CORP., Lansing, Mich., has been incorporated by Wayne Martin to manufacture and sell concrete and cinder block.

INDIAN LAKE CO.,Lakeview, Ohio, has started construction of a new building following a $60,000 fire at the lumber and concrete mixing plant. The lumber yard building will be built adjacent to the burned structures, but the mixing plant is being rebuilt on the same location. The company is a subsidiary of the Bellefontaine Development Co.

ROBERT D. MOODY AND LAYTON WEIDENBACH have opened a mortarless concrete block company at Washington, Iowa.

F. F. MENGEL is constructing a cement storage bin and installing unloading equipment at the Ready Mix Cement Plant, Marshfield, Wis. Cost of the project will be about $7200.

CENTRAL-MIX CONCRETE CO., Rapid City, S. D., has started production of ready mixed concrete with a capacity of 350 cu. yds. per 8-hr. day, K. D. Lynn, manager, announced. The company specializes in air-entrained concrete.

HITZ CONSTRUCTION CO., Billings, Mont., has opened a new plant, 140 x 75 ft., which is constructed of reinforced concrete with a brick and glass brick front. It will house offices, shops and garage. The Hitz company operates nine Ransome truck mixers. Adam Hitz is in charge.

RONALD YOHN, FERD GRELL AND JOHN SCHISEL, who operate the Garner Construction Co. at Garner, Iowa, have announced plans for a ready mixed concrete plant to serve the area. Two International trucks have been equipped with mixing and hauling devices and a bulking plant, elevator and cement house have been installed. Sand and gravel will be obtained from the Clear Lake Sand and Gravel Co.

JOSEPH G. MAHAL AND ROY HARDY, general contractors operating in Redwood Falls, Minn., under the name of Mahal and Hardy, have announced the establishment of the Redwood Ready Mix Concrete Co. in the area. When completed, the new plant will consist of housed-in-bins, batching equipment, a cement storage silo, bucket elevator and a gravel conveyor, plus two truck mixers. A 40 x 32 ft. concrete block garage also is planned.

APPLETON SILO CO., Marshall, Minn., manufacturer of concrete building materials, recently expanded operations with the installation of new machinery, Henry Benson, owner of the firm, reports.

FRANK GRUNEWALD has announced plans to establish and operate a concrete block plant at Windom, Minn.

One of a series of messages to help you increase your understanding of business paper advertising, and its effect on your job.

Why you have a big stake in your company's advertising

No matter what your present job may be, your chances of getting ahead depend on your company's ability to make a fair profit.

As a production man, you have a pretty good idea of how profits are earned. You know that without modern, high-speed production tools, there wouldn't *be* any profits — or any jobs, for that matter. Your cost-per-unit would be so high that you couldn't compete with other manufacturers in your market.

The same thing applies to the *manufacture of a sale!* Without mechanization, the cost of "manufacturing" would be prohibitive.

That's where advertising comes into the picture. Because advertising is simply the assembly-line technique in selling. Just consider the five basic operations involved —

1. **Seeking out prospects**
2. **Arousing their interest**
3. **Creating a preference for your product**
4. **Making a specific proposal**
5. **Closing the order**

Advertising performs the first three of these jobs. And it performs them *far more economically* than any other means, leaving your salesmen free to concentrate on the two that they alone can do, and do best. In that way, advertising increases your company's chance to earn a profit. And that is why you have a big stake in its *efficient use.*

Where can your company's advertising work at its highest efficiency? Where but in those business papers which are concentrated among your company's best prospects — *and no one else!*

ROCK PRODUCTS

is a member of The Associated Business Papers, who have published an interesting folder entitled, "10 ways to measure advertising effectiveness." We'll be glad to send you a copy. And if you'd like reprints of this advertisement (or the entire series) to pass along to others in your organization, just say the word.

before you buy any truck mixer

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It tells you:

Which type, Top Loader or End Loader, best suits your local conditions (Jaeger alone offers both).

The advantages of 2-speed mixing.

The importance of positive water distribution, made possible by the Jaeger grout-proof, clog-proof pressure jet.

What size of truck mixer or agitator is most efficient for your operation — 2-3, 3-4¼, 4½-6⅛, 5½-7⅜ cu. yd. capacities.

Features that the majority of ready-mix operators demand today such as permanently aligned center drum drive, engine and water system enclosed from weather, dual mixing action with die-shaped blades, elimination of overhead water tanks, etc.

If you are in the ready-mix business, or are interested in it, you need this up-to-date buyer's guide.

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Gentlemen: Please send us copy of your new Catalog and Buyer's Guide on Hi-Dump Truck Mixers and analysis of various types.

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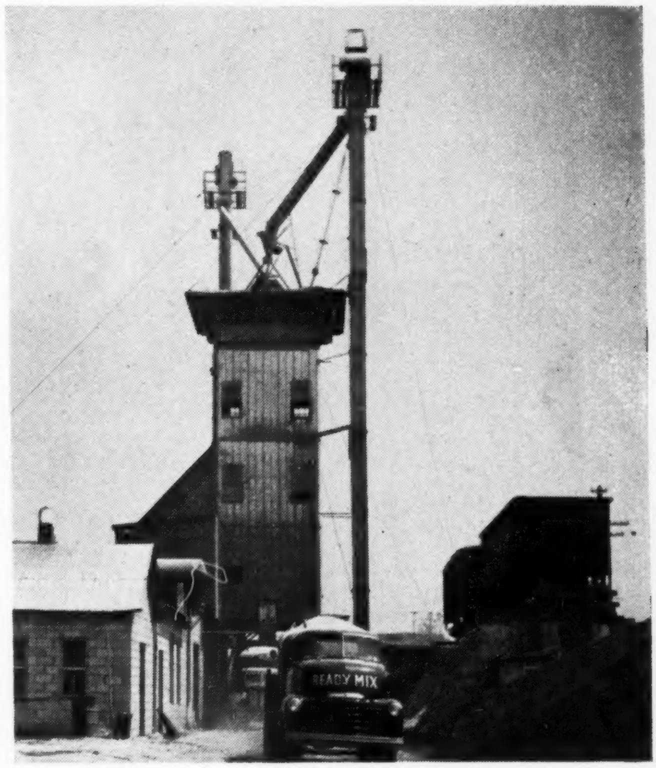
BUILDING HOUSES Using Diversified Line of Products

Greystone Concrete Products, Inc., Henderson, N. C., produces ready mixed concrete, concrete block, in many sizes and colors, and casts septic tanks

By W. B. LENHART

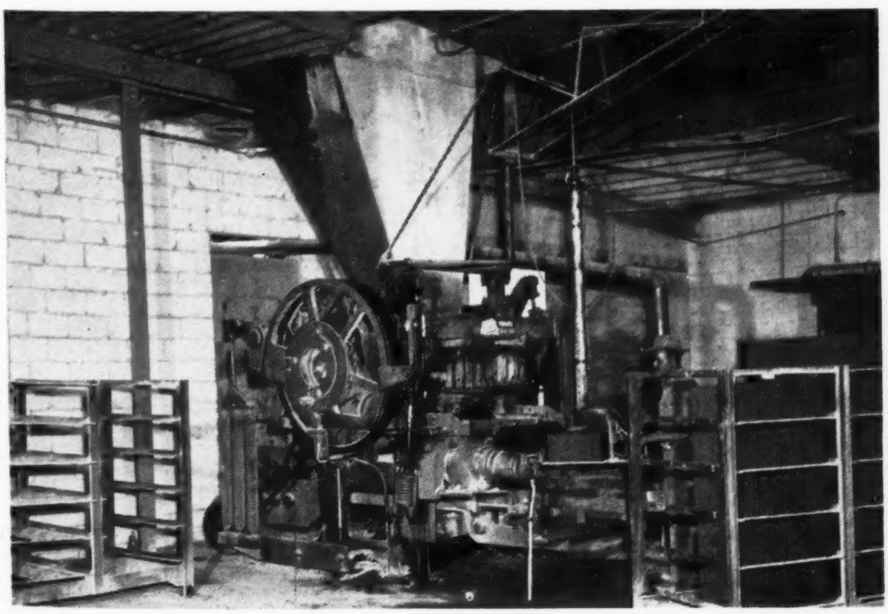


Batching plant to the rear with cement and aggregates received in bulk on adjacent railroad siding and elevated to bins at top of plant

IN LOOKING at the concrete masonry industry in the United States in perspective from observation by actual field contacts, one cannot escape the conclusion that progress is confined to certain localities and these areas are widely scattered and spotted. Certain districts seem to just want to make a block, and then hope that someone will come along and buy it. In such districts the standard 8's find little use except for backing or for industrial buildings that from an artistic standpoint are ghastly. Many of the plants are a discredit to the industry. Other districts are just the reverse. They come out with new and progressive ideas. They make a wide variety of block, large and small, colored and uncolored so that architects can design an all-concrete masonry home that anyone would be proud to own. The plants, too, are neat, orderly and the impression is that the concrete masonry industry is a basic industry and here to stay.

Build Moderate Priced All-Concrete Houses

Certain manufacturing trends are also easily apparent for the industry is getting into better hands, and greater engineering skill is being exercised in the manufacturing plants. There are also signs of selling trends and methods of marketing concrete masonry. One important development in this branch of the industry was just recently started by the Greystone Concrete Products, Inc., of Henderson, N. C.



High production concrete block machine recently installed

This company's management thought that a better use for concrete masonry could be found than simply back-up for clay brick and industrial construction. Taking the "bit in their teeth," this company started constructing entire homes at a modest price. The homes are "all concrete." The houses built so far have been of five rooms, including two bedrooms, with a full basement and furnace. Some are stuccoed on the outside and others have the masonry exposed. The company has its own construction staff, and at the outset are keeping six masons at work. The homes are priced to sell in the $7500 range. The construction underway shows that the homes are neat, substantial, and a credit to any community and no doubt can well be followed by other manufacturers in other cities where the use of block for home construction lags.

Officers of the Greystone Concrete Products, Inc., are all experienced in selling various aggregates and building products, and about two years ago they formed the present company and built a neat plant located about two miles north of Henderson on U. S. Highway No. 1. A. D. Capehart is president of the company; J. F. Cannady, secretary and treasurer; and V. E. Hedrick, vice-president and general manager.

Sell Ready Mixed Concrete and Complete Products Line

For block manufacture, the plant uses Johnson bins and batchers and a Besser Vibrapac. Block plant capacity is 6000 standard 8-in. units or equivalent daily. Most of the company's sales are through dealers. A fleet of three Jaeger ready mixed con-

Over-all view of plant and storage yard with office to the right

crete trucks is operated. Products include sand and gravel, aggregate block, cinder and also slag block. About 50 per cent of their sales are of the hard aggregate block with 40 per cent cinder and 10 per cent slag. Cinders come from Birmingham, Ala., and the slag from Sparrow's Point, Md. Besides ready mixed concrete and block, the company manufactures precast concrete lintels, concrete steps and septic tanks.

Septic tank manufacture fits into the home construction program. The company makes two sizes of septic tanks, the 700- and the 900-gal. size. The former weighs 6480 lb. and is priced to sell in the $90 range. They are 4 ft. wide, 7 ft. 2 in. long, and 5 ft. 2 in. high. Of conventional two-compartment design, the dividing partition is cast separate and slipped into place in grooves provided in the vertical walls of the tank. Inside the tanks and at each end are cast two lugs that project out from the ends a few inches. These are used for loading the septic tanks on the company's specially designed haulage truck. To load the tanks on the trucks a timber the length of the inside of the tank is placed under the lugs.

Cast Septic Tanks Below Ground Level

Septic tanks are cast in a depression in the yard. Three tanks can be cast at one time. By having the forms in the depression, the concrete can be easily poured from mixer truck chutes into the tops of the forms. For handling the steel racks in and around the plant, two Clark lift trucks are available. These operate for the most part in a paved yard. The racks are unloaded by a Besser "cuber." The cuber is mounted on the extension of the main building.

Steam for the 11 kilns is provided by a Cleaver-Brooks Co. automatic, oil-fired steam plant, Type LC-8. These kilns hold 1½ days' production. This boiler is entirely automatic.

(Continued on page 225)

Pouring concrete from ready mixed concrete truck into steel septic tank mold in pit lined with concrete block

Hoist frame designed to lift septic tank from pit into delivery truck and lower at point of installation of the unit

Close-up of septic tank form in pit, ready for pouring of concrete

"PALLETIZING" Block Handling

Linton Concrete Products, Tonawanda, N. Y., transports cubed block on wooden pallets to stock pile and to job site

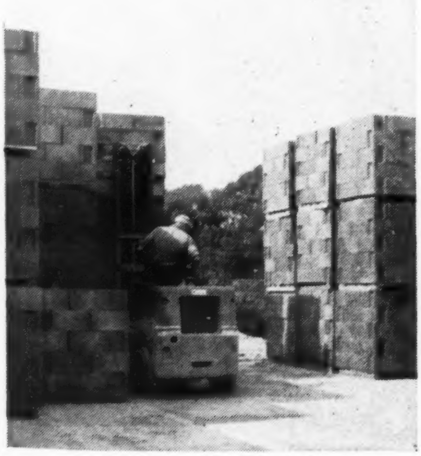
By W. B. LENHART

View of plant, showing truck, to the left, unloading bagged cement which is elevated to mixing floor on inclined belt conveyor. Cubed block, foreground, ready for pickup by lift truck

HANDLING and loading all block on wooden pallets has been found to be the most economical method by the Linton Concrete Products of Tonawanda, N. Y. This method of transporting block has been developed out of a background of 33 years experience in concrete masonry manufacture. The blocks have to be cubed after removing from the steel racks so they pile them on wooden pallets at this first and only handling. The system is based on the use of smaller pallets than those used by most operators. Sixty blocks (8- x 8- x 16-in. units) to the pallet gives a greater flexibility with less manual handling than if larger cubes are used, according to this company's experience. As the cubes are "laced" while piling they are quite rigid.

The first objection that comes to the mind of many readers will revolve about the return of the pallets by the customer. The Linton Concrete Products sells a high percentage of its products to contractors and dealers who have been doing business with the company for many years. It is a simple matter for the truck that delivers a load of blocks to an old and continuous buyer to pick up the pallets from a previous sale. About 95 percent of the company's business is through

Lift truck loading cubed block on wooden pallets



Lift truck stockpiling cubed block on wooden pallets

these steady and large buying customers.

Pallets are 38- x 38-in. in area (the size of the cubes) and are made up of 3- x 4-in. cross pieces of yellow pine or hemlock. The top is of 1-in. oak, rough planking. The pallets weigh about 40 lbs. each, and are heavy enough so that the wind will not blow the empty, returning pallets off an open truck. No lashings are necessary. Based on the production of its Besser SuperVibrapac, the company owns 2641 pallets. It figures that to carry out this scheme of handling, one pallet is required approximately for every two blocks of plant capacity.

F. L. Kiphuth, manager for the company pointed out that one of the principal advantages of the 100 percent use of wooden pallets was that mechanical loading of an open truck could be done without any restacking of the blocks. On a flat rack one of the three Clark lift trucks picks up the relatively small pallet with its 60 standard blocks and spots it on the flat rack where wanted. When the bed is filled with eight of these pallets, for example, a second row can be piled on top of the first. The pallets then act as cross-binders holding together and stabilizing the load. The cubes of blocks as originally piled on the pallets are cross-laced and on the delivery truck this helps reduce side sway. It can be readily seen that a pallet of 60 blocks will be five blocks high or 40-in. Such a pile will ordinarily ride a flat rack without binders. To pile a load 10 blocks high unless re-stacked by hand so as to re-lace them, would be almost out of the question. But by the use of wooden pallets such a high load can be stabilized and delivered without binders or hand-stacking in the truck.

If blocks are loaded onto a dump truck, as is often the case, the cube

(Continued on page 225)

Stockpile of pallets. Note sturdy construction

Discharging aggregates to bins, to the right, above. Driveway below is used by mixer trucks

Loading aggregates to truck. Small screen is mounted at end of loader elevator for separation of mason sand

GRAVITY BATCHING SYSTEM

Supplies Concrete Products and Ready Mix Departments

Sager Concrete Products, Co., Jackson, Mich., reduces material handling and batching costs by utilizing gravity flow

By DAVID MOCINE

CONSTRUCTED at one side of a worked-out gravel pit, the new plant design of Sager Concrete Products Co., Jackson, Mich., takes advantage of gravity material flow in this location. The gravel pit was excavated from the side of a hill for the express purpose of locating a concrete products plant on the site. Overhead bins for aggregate and bulk cement storage are loaded directly from delivery trucks, which back out over a trestle with reinforced concrete bents having timber stringers and floor joining the top of the plant to the top of the hill, which are at the same level. Gravel pit excavation started in 1935, the block plant was built in 1940, and the ready-mixed concrete plant the following year.

Aggregate storage comprises a four-compartment Blaw-Knox bin, with a capacity of 100-cu. yd. Lightweight aggregate in one compartment can be drawn through a pants leg chute to either the block machine mixer or ready-mixed concrete trucks. Present bulk cement storage capacity is 140 bbl., but it is planned to install an additional bin of 300 bbl. capacity, which will permit the company to keep more than one type of cement on hand. Both cement and aggregate batchers are of Blaw-Knox manufacture and incorporate Howe scales. Aggregate used in block manufacture is approximately 49 percent sand and gravel; 49 percent cinders; and 2 percent or less Celocrete. Almost all ready-mixed concrete is proportioned with regular sand and gravel, with an occasional order for Celocrete aggregate.

Provision For Mixer Trucks

Weigh-batchers for ready mixed concrete and the block machine mixer are located on a mezzanine floor below the overhead aggregate and cement bins. Transit-mix trucks drive in one side of the building, pass directly under the weigh-batchers, and after loading, continue out the other side. This is a one-stop operation, with the truck being charged with aggregate,

Bulk cement truck on trestle ready to dump to plant bins, below. R. W. Sager, manager, talking to driver

Mixer truck leaving plant. Note reinforced concrete trestle, to the left

cement and water at one station. The company fleet consists of four 3-cu. yd. Rex; one 3-cu. yd. Jaeger; and one 2-cu. yd. Smith, which cover an area within a 30-mile radius from the plant. In addition to transit-mix trucks, one Dumpcrete, a non-agitating type ready mixed concrete carrier, completes the fleet. This last mentioned truck is used for a number of different jobs around the plant. Roads and highways in this section of Michigan are in particularly poor condition and it is almost impossible to take even a 2-cu. yd. mixer truck over some of them without violating weight restrictions. Sager Concrete Co. sometimes overcomes this difficulty with the lighter non-agitating equipment by ferrying concrete between the mixer truck parked on a highway and the job located on a side-road. The Dumpcrete is also used for hauling aggregate for the plant, or hauling masons sand from the company pit to a customer.

Block Production

Block at this plant are made on a 500-block per hr. Stearns No. 9 Joltcrete, supplied concrete from a 28-cu. ft. Stearns overhead mixer. Two turntables are located in front of the machine for ease in handling block racks, which are spotted or removed, when filled, by an Erickson platform lift truck. Work is progressing on an installation of five kilns, three of which are nearly completed. Kilns are constructed with walls of 8- x 8- x 16-in. block, and a poured-in-place reinforced cinder concrete roof, topped with a 4-in. Zonolite concrete slab. Cinder concrete is hauled in mixer trucks; but the Zonolite concrete cover is hand mixed in place. Dimensions of the kilns are: 7½-ft. high, 13-ft. wide, and 37-ft. long.

Kiln capacity with present equipment is 864 block each, but when a contemplated Stearns plain-pallet model 15 block machine is installed, block racks will be changed, allowing a kiln capacity of 1500 block. Included in plans for increasing capacity of the block plant is the purchase of a Clark fork lift truck, coupled with a change to cubing block for yard storage. To provide steam for the kilns, a new low-pressure Kewanee boiler is being set on a concrete foundation. The boiler will be fired by an automatically controlled stoker. Also included in future plans is some form of waste-heat boiler, utilizing stack-loss to heat mixing water for both block and ready mixed concrete.

Curing Cycle

Curing cycle to be maintained will be 2 hr. setting time; 2 to 3 hrs. live steam, depending on the weather, to bring kiln temperature up to 170 deg.; then a soaking period for approximately 16 hrs. with the live steam cut off. With this curing cycle, sand and gravel block test at 1600 p.s.i. and cinder block test at 1200 p.s.i., both at 28 days. All modular sizes of brick and block are manufactured at this plant, and the company expects to start production of floor slabs, lintels, and joists in the immediate future. The yard contains a 40- x 100-ft. paved, covered storage space.

Railroad cinders, hauled to the plant in company trucks, are sized by a 3- x 6-ft. single-deck Simplicity vibrating screen, fitted with interchangeable cloth, and mounted on a Barber-Greene bucket loader. This bucket loader and screen combination, having a capacity of 3-cu. yd. per min. is also used to load a small amount of masons sand reclaimed from one corner of the pit. R. W. Sager is owner-operator of Sager Concrete Products Co.

TEXCRETE Co., Dallas, Texas, is receiving bids for a one-story haydite plant to cost $50,000.

Block machine, to the left, and ready mixed concrete truck, to the right, both receive aggregates water and cement from mixer floor above

Fiber Concrete

WARTIME INVESTIGATIONS IN THE CONCRETE PRODUCTS FIELD conducted at the University of Michigan brought forth a light-weight fiber concrete reported to be several times more resistant to damage by fire than normal sand-cement concrete. According to Corwin D. Willson, engineer in charge of the research project, fiber concretes are extremely resistant to fire. A 2-in. cube, placed over a large Bunsen burner flame for 20 minutes, will char to a depth of ¼-in., whereupon this charred portion serves to insulate the balance of the specimen against disintegration. Due to the poor thermo-conductivity of fiber concrete, the dehydration of the cement matrix does not proceed as rapidly when the surface of the specimen is subjected to high temperatures as in normal sand-cement concrete, Mr. Willson explained.

More than 8000 specimens from 225 different materials were prepared and examined in the research to find a hard-setting, light-weight plastic composition having a lattice of fibrous materials, a binding matrix of portland cement, and a chemical admix; and suited to be formed by machine into a sheet, or into an insulative panel or floor covering in building construction, or to be poured, sprayed or otherwise manually or mechanically applied in factory or field fabrication. The comparison sought was to be resistant to fire, rot and termite, and suited to exterior exposure. A large number of the compositions tested had specific merits. One composition was a solidified "foam," lighter than cork. In the density range of about 75 lb. per cu. ft. some of the compositions developed compressive strength above 4000 lbs. p.s.i. and tensile strengths of 750 lbs. p.s.i.

The above information is taken from a research report on lightweight aggregate materials now on sale by the Office of Technical Services, Department of Commerce, Washington 25, D. C. The document is a final report on wartime research sponsored at the educational institution by the Office of Production Research and Development of the War Production Board.

Company Changes Name

ROCES AND WHITE, INC., Manila, Philippines, has been changed to Permanent Concrete Products, Inc., with offices in the Ramon Roces Building, 1055 Solar corner Calero streets, Manila. Ramon Roces is president of the firm, which produces sand and gravel and concrete block.

Oxychloride Cements

COMMITTEE C-2 on Magnesium Oxychloride Cements, American Society for Testing Materials at its first meeting accepted recommendations for the publication of nine tentative methods of test consisting essentially of basic tests on oxychloride compositions.

PRECAST CONCRETE For Beauty and Utility

Durastone, Inc., Saylesville, R. I., manufactures precast curbing in large volume, architectural ornaments, and Flexicore roof and floor slabs

By CHAS. H. LEACH

A 10-ton overhead traveling crane carries 1-cu. yd. bucket in position to pour concrete into sand molds for highway curbing To the rear may be seen curbing sections removed from molds

FOUNDED by the Beretta family 15 years ago, Durastone, Inc., of Saylesville, R. I., now makes most of the gleaming white curbing for Rhode Island's state highway system.

Curbing, which is cast in sections, comprises a mixture of two parts pea-size blue stone and 1½ parts coarse sand to one bag of Portland cement. Cast in a sand mold, the curbing section is 72 in. long, 18 in. high, and 12 in. thick with a bevelled face of 6 in. They are cast with ½-in. steel dowels in each end. After hardening one set of dowels is removed, leaving holes for "pin-and-hole" joining when installed. Castings are also fitted with two loops of heavy-gauge wire for lifting.

When the concrete has set sufficiently for removal from the mold the curbing section is carried by overhead crane from the molding floor to the rear of the long building where cement finishers remove the rough spots and surplus concrete with air-operated chisels. They are then finished by a process of rubbing, brushing, and smoothing, and the outside crane carries them to the outdoor curing piles where they are stacked before delivery.

Although this operation appears simple when one is watching or explaining it, it is the result of much experimenting and trial-and-error studies. Because the molders are expert from long practice one gets the impression that it is easy.

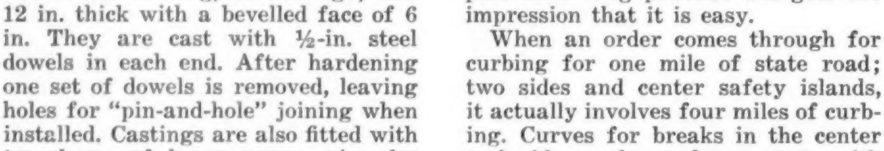
When an order comes through for curbing for one mile of state road; two sides and center safety islands, it actually involves four miles of curbing. Curves for breaks in the center and side roads, curb segments with openings for surface drainage, and the straight-away sections must be estimated. There are 880 6-ft. segments to the mile; 3520 pieces for this order.

Dimensions on sectional drawings are given to the pattern maker. Patterns, made from soft pine and ½ in. plywood, are the exact size and shape that the finished section will be. They are nailed and braced solidly and resemble an open box with partitions. On the part of the pattern, which will be the back of the casting, a board is fastened lengthwise. This cleat ties the model and the braces together and also serves as a handle to lift or move the pattern.

The floor molder places this pattern on the molding floor which is a smoothed surface of molding sand, a common fine sand mixed with a small amount of marble dust. Molding sand is heaped around the pattern with a shovel, which is tamped tightly with a hammer head, and finished off with a straight-edge and trowel. A square shovel is used for trimming. He signals for the crane, taps the pattern lightly with his hammer to loosen it, fastens a sling to the handle of the pattern and the crane lifts it, leaving a perfect mold to receive the concrete. When the floor is prepared with a predetermined number of molds the cement gang begins to charge the 1-cu. yd. Jaeger mixer with the specified aggregate.

The mixer is located below the floor in a pit large enough to receive the 1-cu. yd. bucket lowered by the 10-ton P & H overhead traveling crane. The charging hopper is near the floor level of the aggregate stock piles and is loaded by wheelbarrows. When the mixer is emptied and while the concrete is being poured into the molds the gang prepares another batch. Thus, Durastone will mold and pour 150 segments of curbing in one 8-hr. day.

However, curbs are the least ornate of Durastone products. Many bridges and public buildings bear evidence of the skill of these craftsmen.



Overall view of cast stone plant, showing overhead crane for outside stockpiling

Checking wooden pattern of voluted corbel to be cast in concrete

Architectural Cast Stone

In making architectural cast stone, Portland cement is mixed with various aggregates according to the designers' specifications. These may be crushed granite, marble or limestone. For shading, zinc oxide, Belgian Red or yellow pigments are blended with the mixture. Zinc oxide, which is a permanent dark grey or black, mixed with pure limestone gives to the cast product the black fleck so often present in natural granite. Products cast from the above aggregates can be finished to an absolutely smooth surface with a high polish by a grinding and buffing process. These are molded in the same manner as the curbs, and are of such minute exactness that at the site of installation they fit together like the parts of a huge, three-dimension jig-saw puzzle. Panels, cubes, jambs and corbels meet and join one another to form a perfect arch or a beautiful scroll-capped column supporting a cornice of like material.

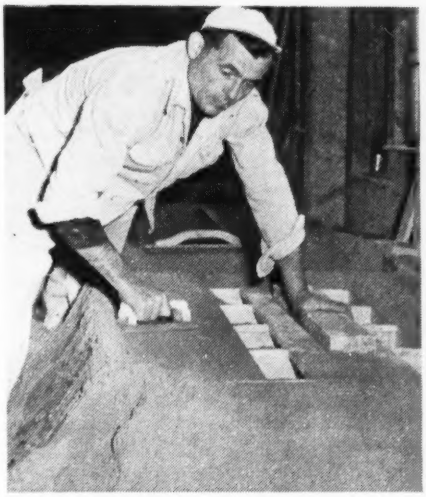
All segments are worked out in detail in the drafting room and no pattern is made that cannot be handled easily by two men. A design will call for fluted columns or pilasters, volutes, frets and panels; and each one is made with a skill that is amazing. The Durastone pattern maker is a sculptor in wood.

Concrete bucket suspended from overhead traveling crane in position for pouring. Note guide trough for directing concrete into mold

Make Floor and Roof Slabs

Other castings turned out by the company are: ornamental bird-baths, stanchions for park benches, concrete practice-torpedoes weighing 2100 lbs., and "Flexicore" floor and roof slabs. The torpedoes are used by military flyers to learn the art of skip bombing.

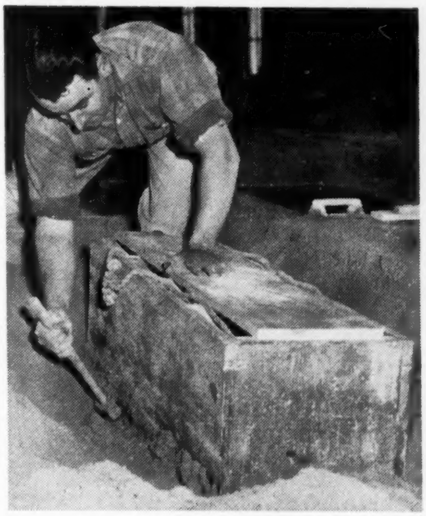
Huge slabs, 4, 6 and 8 in. thick, 7 ft. and 8 ft. high, and up to 14 ft. long are being cast for partitions for a dormitory to be erected at the University of Connecticut. These are not molded in the sand, however, but are formed in a mold of angle-iron fastened firmly with clamps. Most of them are made outside the building where pouring and stacking is handled by a mobile boom-crane.



Dressing off molding sand with steel trowel. Wooden pattern will be carefully lifted by crane, leaving exact shape of casting

One problem that brought unusual complications was a contract to erect a memorial in a nearby city. This monument was a large, rectangular tablet flanked by fluted pilasters capped with frets and volutes and surmounted by a perching eagle. But nowhere in the entire establishment could be found a model of this noble bird. The task of carving one from wood or hewing one from stone was greater than the ability of any one of Durastone's employees. The cost of commissioning a sculptor to do the work was prohibitive.

All the other parts were skillfully cast and ready for assembly but—no eagle. Then one day an executive of the company came in with a papier-mache eagle of the right size and posture. A plaster of paris model was made and submitted for approval. It was accepted and the finished product of granite was cast from this pattern. The papier-mache eagle had been part of a window display advertising a well-known brand of whiskey.



Tamping molding sand around pattern. Sand includes a small amount of marble dust which is kept slightly moist

Carbon-Black For Air-Entrained Concrete

CARBON-BLACK EMULSIONS, long used to color concrete used in center strippings, passing lanes, etc., to distinguish it from plain concrete, have created a problem when used with air-entrained concrete. It has been found that normal percentages of entrained air are not obtained when carbon black is used in the concrete. The percentage of air-entraining agent which would normally entrain 5 percent of air in regular concrete, will entrain only 2 percent or less in concrete which contains finely divided carbon-black dispersions, according to tests conducted by the Research Division of the Dewey & Almy Chemical Co.

Chemists decided that the selective adsorption of the air-entraining agent by carbon black was very largely dependent upon the size of carbon particles. Further tests showed that above a certain minimum size such selective adsorption was minimized to the point where its effect was not of any consequence. Current findings show that the new carbon-black dispersions, while giving a satisfactory color value, will have no effect on the action of air-entraining agents normally employed in concrete today.

Wall and Floor Leveler

TAMMS SILICA CO., Chicago, Ill., has announced two new products, Tamms Floorstone and Tamms Wallstone. Floorstone is used to level all types of sub-floors, including concrete and pre-cast concrete floors, prior to installing finished floors. Wallstone is used to level rough walls preparatory to applying wall coverings, and can be used for cracks, breaks, holes, grooves, or low spots, the company states. Both products come in dry powder form and mixed with water can be applied in any thickness, setting in 30 minutes.

CURING

A Problem in Thermodynamics

An analysis and application of thermodynamic principles in high temperature atmospheric pressure curing as developed from tests at Wm. Moors Concrete Products, Fraser, Michigan

By GEO. A. MANSFIELD*

IN the February 1947 issue of ROCK PRODUCTS, the author described an application of live steam for high temperature curing of concrete, and the test results indicated a superior process of obtaining quality masonry units economically. Numerous questions have arisen on the technicalities of heat and moisture application for the hydration of the cement, and it is the intent to discuss in detail the atmospheric conditions that cannot be ignored in the design of a high temperature concrete masonry curing system.

When normal atmospheric temperatures are employed, adequate curing can be maintained with the units developing high strengths provided sufficient moisture is present during the curing cycle. This method requires a period of yard storage and may be entirely satisfactory in a low production plant. A high production plant, however, requires a more rapid movement of the units from the machine to the job site and demands an accelerated curing method. Too often accelerated curing is considered in terms of high temperature with moisture considered a necessary evil

Concrete when properly cured at normal atmospheric temperatures results in a tough building material, but how often do we see concrete masonry units cured at high temperatures that are brittle and subject to breakage during handling although satisfactory specification strengths were obtained. Whenever a brittle concrete masonry unit is produced, it can be concluded that the binding ingredient, Portland cement, has been damaged during the curing cycle. When Portland cement is damaged by high temperature curing, it can be concluded further that a sufficient quantity of moisture was not in immediate contact with the cement, and, under this condition, the normal products of hydration were not able to develop. It is essential, therefore, that sufficient moisture be in contact with Portland cement during the entire curing cycle.

Properties Dry Air Saturated

To understand the difficulties of maintaining moisture in contact with cement during a high temperature curing cycle in a kiln at atmospheric pressure, the properties of air at various temperatures must be examined thoroughly. Consider the data in Fig. 1, selected from the table "Thermodynamic Properties of Moist Air" contained in the American Society of Heating and Ventilating Engineers Guide, that points out the amount of moisture necessary at high temperatures in order to maintain one hundred percent humidity.

The thermodynamic properties of dry air saturated are listed in 10-deg. increments from 70 to 200 deg. F., inclusive. Column *B* shows the moisture requirements per pound of dry air; column *C*, the saturation pressures in pounds per square inch; column *D*, the heat content per pound of dry air; and column *E*, the heat content of the moisture of dry air saturated. The thermodynamic data is tabulated to show the decidedly progressive demands in moisture requirement, saturation pressure, and heat content of dry air saturated as against the

THERMODYNAMIC PROPERTIES of MOIST AIR*

(A) Temp. Degrees Fahr.	(B) Moisture lbs./lb. dry air	(C) Saturation Pressure lbs./sq.in.	(D) B.T.U. per lb. dry air	(E) B.T.U. of Saturation Moisture
70	0.016	0.36	16.79	33.96
80	0.022	0.51	19.22	43.69
90	0.031	0.70	21.59	55.70
100	0.043	0.95	24.03	71.73
110	0.059	1.27	26.40	91.86
120	0.081	1.69	28.84	119.54
130	0.111	2.22	31.20	154.93
140	0.153	2.89	33.66	205.66
150	0.211	3.72	36.02	273.19
160	0.299	4.74	38.47	376.27
170	0.433	5.99	40.88	531.48
180	0.658	7.51	43.29	791.79
190	1.083	9.34	45.66	1285.37
200	2.295	11.53	48.12	2677.12

* Selected from Table contained in A.S.H.& V.E. Guide

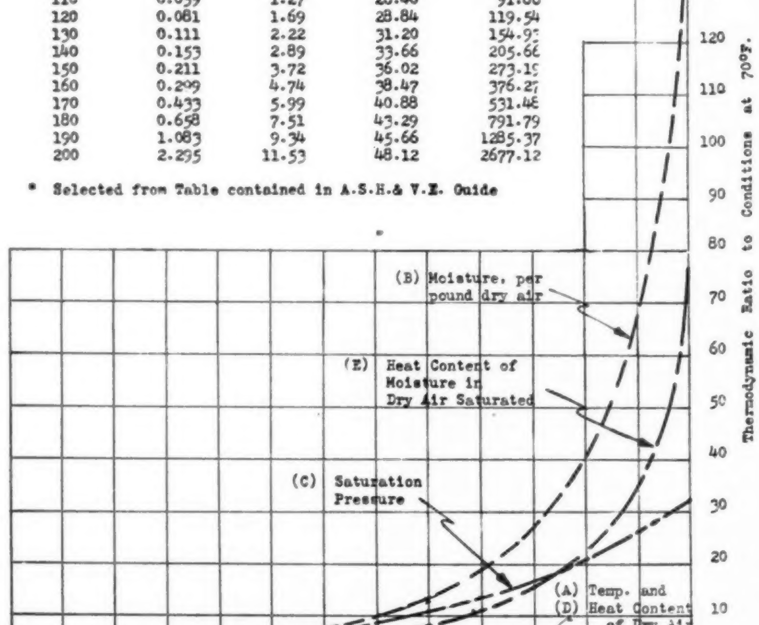


FIG. I

Fig. 1: Thermodynamic properties of moist air. Curve (A) represents temperature ratios; curve (B) gives moisture requirements for dry air saturated; curve (C) shows progressively increasing saturation pressures; curve (D) indicates heat content of dry air

*Technical Service Director, Huron Portland Cement Co.

straight line demands in temperature and heat content of dry air.

The curves in Fig. 1 were established by plotting each thermodynamic property from 70 to 200 deg. F. in 10-deg. increments and expressed as a ratio to the condition at 70 deg. F. The curves clearly emphasize the problem of maintaining a saturated atmosphere when elevated temperatures are contemplated for accelerated concrete masonry curing in a kiln at atmospheric pressure. Curve (A) represents the temperature ratios and naturally is a straight line relationship; curve (B) expresses the moisture requirement for dry air saturated, and forcibly illustrates the progressively increasing demand for moisture to maintain total saturation as the temperature is raised. For example: at 120 deg. the moisture requirement is a ratio approximately five times that at 70 deg.; at 140 deg. the ratio is 9½; at 160 deg., the ratio is 18½; at 180 deg., the ratio is 41; and at 200 deg., the ratio is 143½ times the requirement at 70 deg.

Curve (C) portrays the progressively increasing saturation pressures related to the condition at 70 degrees. Although this curve is not as pronounced as Curve (B), the ratio here, too, increases progressively and confirms the fact that it is difficult to hold the kiln air at the proper thermodynamic condition during high temperature curing of concrete masonry in a kiln at atmospheric pressure. A comparison of the saturation pressure ratios can be made from Curve (C) as was made for moisture requirements as described for Curve (B). This condition must be given serious consideration in curing because the vapor pressure is exerted within the kiln at all times during the curing cycle and it is higher within the kiln than the vapor pressure outside the kiln. These two conditions are not in equilibrium. For example: a kiln curing at 160 deg. exerts a vapor pressure at saturation within the kiln approximately 13 times as great as the vapor pressure at saturation outside the kiln for air at 70 deg. If the air outside the kiln is less than a dry air saturated condition as measured by relative humidity, then the ratio would be greater. An atmospheric condition of 70 deg. at 50 percent relative humidity would result in a pressure differential of 26 to 1 between the kiln air and the atmosphere. Higher kiln air temperatures give greater differences in vapor pressures and successively lower humidities of the outside atmosphere influence the differences successively higher. Under these conditions moisture will be forced from within the kiln to the atmospheric air.

Saturation pressure is also present within the masonry unit during curing, and because of the differences in pressures between the kiln air and the atmospheric air that lowers the kiln air vapor pressure, a differential in pressure will result between the masonry unit and the kiln atmosphere. This condition will cause a loss of moisture from the masonry unit, the degree of moisture removal being dependent upon the temperature of the curing atmosphere, the length of time the masonry units are subjected to these temperatures, and pressure differentials. Further, humidity measurements can be made in a kiln under these conditions from which false conclusions can be drawn because the measurements can indicate 100 percent humidity in the kiln atmosphere while actually the moisture is being removed from the masonry units. This moisture becomes part of the kiln atmosphere to indicate ideal curing conditions but the binding ingredient, Portland cement, is being damaged because of insufficient moisture being in contact with the cement.

Minimum Water-Cement Ratio

The question arises—What is the minimum desired quantity of water to effect the normal compounds of hydration in Portland cement? Experience and tests have proved that a minimum water-cement ratio of 0.44 by weight of cement is required, which is equivalent to approximately 5 gal. of water per sack of cement. Now consider the water present in a concrete block mix in the range of 3 to 4 gal. per sack of cement, which in any case is below the desired water-cement ratio. It is essential therefore that the method of curing at least retain the water incorporated in the concrete during mixing.

Also included in Fig 1 is the B. t. u. requirement to heat dry air, Curve (D); and moist air totally saturated, Curve (E). The Curve (D) ratio is identical to the temperature increase Curve (A) but when the air is totally saturated, an accelerated B. t. u. requirement is necessary for increasing the temperature of a saturated atmosphere.

Carbonation of Concrete

Another factor that should be considered in curing of concrete masonry is the carbonation of the concrete. When sufficient moisture is not present with Portland cement during the curing cycle, carbon dioxide from the kiln atmosphere is absorbed by the concrete and this can be detrimental or beneficial. If the carbonation occurs before the period that the Portland cement hydration compounds are being formed, then it is detrimental, but if it occurs following the hydration, then it is beneficial. As the concrete becomes successively drier, the rate of carbon dioxide absorption becomes increasingly greater. In view of the harmful effect of carbonation during hydration, caution should be observed in selecting a curing method developing heat and moisture, particularly when a system is being considered wherein the products of the fuel combustion become a part of the kiln atmosphere.

In the process of fuel combustion free oxygen of the air burns with the fuel carbon to form carbon dioxide. The maximum amount of carbon dioxide by volume obtained from complete combustion is 20.2 percent for anthracite coal, 18.2 percent for bituminous coal, 15.5 percent for oil, 12.0 percent for natural gas, and 11.0 percent for coke oven gas. When carbon dioxide from fuel combustion becomes part of the kiln atmosphere and this atmosphere is not changed, then the kiln air can become highly saturated with carbon dioxide that is harmful to the concrete and, although strengths may be favorable, the units will be extremely brittle. When the carbonation develops after formation of the hydration compounds, then the masonry units will be tough and will have excellent strengths.

Carbon monoxide is also given off during combustion and it might be interesting to point out that the maximum allowable concentration of carbon monoxide is 100 parts per million, and for carbon dioxide 5000 parts per million, as determined by the U. S. Bureau of Industrial Hygiene. Under some curing methods these concentrations can be easily exceeded, which affects the efficiency and health of products plant employees.

How then can a curing method be effected that will be an accelerated high temperature cycle and produce a high strength, tough, durable building material?

A few years ago, the Concrete Curing Corporation of Detroit, Michigan, the Huron Portland Cement Company, and the Wm. Moors Concrete Products cooperatively developed theories and performed tests that established a curing cycle that is being used today by a number of products plants throughout the East and Middle West. These plants are a daily testimony that the curing method, which is a live steam system, is economical, highly accelerated, and productive of as high a quality unit as is known today.

Selecting the Boiler

In the initial considerations of the most efficient method to produce both heat and moisture, it was decided that the use of live steam without additional heat or moisture in the kiln would be most practical. Next, the quantity and quality of the steam had to be determined to produce an atmospheric condition of desired humidity within the kiln. Naturally, the most important unit in the live steam curing system is the boiler. The size of the boiler is dependent upon the load requirements of the kilns, the number of kilns to be cured simultaneously, and the plant load other than curing that is connected to the boiler. A fire tube boiler of large water capacity and large heating surface is better suited for a processing job in live steam curing than a self-contained boiler or water tube boiler. The larger the water capacity of the boiler, the less will be the concentration of scale forming elements in the boiler for a given period of time. The greater the heating

surface of the boiler, the thinner will be the scale deposit for a given period and the less will be the loss in heat transmission through the tubes, with a net result of higher boiler efficiency.

Boilers are rated on the basis of horsepower where one boiler horsepower is equivalent to the evaporation of 34.5 lbs. of water from and at 212 deg. F. at atmospheric pressure. In other words, a 100 hp. boiler is capable of generating 3450 lbs. of steam from and at 212 deg. F. Practically all of the boiler feed water is used to develop live steam and enters at an average temperature of 50 deg. F., and under this condition the 100 hp. boiler will not deliver 3450 lbs. of steam at 212 deg. F., but only 2960 lbs., or about 86 percent of the steam generating capacity of the boiler at atmospheric conditions.

The amount of boiler make-up water varies over a wide range as indicated by the amounts required per hour for the plants employing the live steam system when operating under full capacity. The make-up water demand ranges from 300 to 900 gal. per hour. Excellent results have been obtained by using a boiler for preheating the make-up water before feeding the processing boiler and it should be of a type that is easily cleaned. In preheating make-up water to a temperature range of 170 to 200 deg. F., the solids constituting the temporary hardness of the feed water are precipitated in the preheating boiler. Preheating will also de-aerate the make-up water, eliminate the condition known as "cold shock", and increase the steam developing efficiency of the processing boiler.

Steam Conveying Lines and Distribution

The design of the steam conveying lines is of utmost importance. It is commonly known that steam on emerging from an open end nozzle as is used in the live steam system undergoes an adiabatic change, for example: if steam emerges from a nozzle at 10-lb. pressure in a dry and saturated condition, such steam will contain 20 deg. of superheat or a temperature of 232 deg. If the steam contains moisture, then the superheat would diminish but the steam would emerge with entrained water. Fig. 2 exhibits the condition of the steam for different moisture contents emerging from a 2-in. nozzle at 10-lb. nozzle pressure with a discharge of 4300 lb., of steam per hour.

FIG. 2: EFFECT OF QUALITY OF STEAM ON ENTRAINED WATER

Moisture Content at Nozzle	Entrained Water per Hour
Dry and Saturated	20° Superheat—no entrained water
1%	2° Superheat—no entrained water
2%	43 lbs. entrained water
3%	86 lbs. entrained water
4%	120 lbs. entrained water
5%	153 lbs. entrained water

Note: Steam emerging from 2-in. nozzle, 10 p.s.i. gage pressure at nozzle and 4300 lbs. steam per hour discharge.

The entrained water is in the form of solid particles, and when carried along by a medium travelling at a velocity in excess of 40,000 ft. per minute, one can readily see the harm that can be done to the masonry units. It is essential that pipe lines and insulation be designed so that the steam leaves the nozzle in a dry and saturated condition.

The nozzle to be used is dependent upon the internal load and shape of the kiln. The discharge from a nozzle is a function of the nozzle diameter and the pressure on the downstream side of the nozzle. Fig. 3 contains data on the effect of nozzle diameter on the pressure and velocity to maintain an assumed discharge of 1350 lbs. of steam per hour. This shows how necessary changes in velocity design can be accomplished.

FIG. 3: EFFECT OF NOZZLE DIAMETER ON PRESSURE AND VELOCITY

Nozzle Diameter Inches	Abs. Nozzle Pressure P.S.I.	Velocity Feet per minute
1"	30.0	51,000
1¼"	19.7	44,200
1½"	17.3	35,000
2"	15.7	24,000

Note: 1350 lbs. of steam per hour discharge.

Up to this point the discussion has covered the problems to be overcome in high temperature curing, the heat and moisture requirements and the steam generating system. A description and explanation of the method of steam application and the atmospheric conditions within the kiln will be considered next. A kiln 7 ft. high, 8 ft. wide, and 45 ft. long, containing 12 racks of 72 block each or a total of 864 block, is selected with a nozzle extending 6 in. into one end of the kiln at the ceiling midway between the side walls.

Steam entering a kiln at the ceiling through a nozzle has often been questioned because some plants have found that more favorable results were obtained by entering the steam at the floor through a series of orifices in a pipe or pipes the full length of the kiln. If the steam is generated as previously outlined, the moisture in such steam coming out of a single large pipe is heavier than air and will settle on the concrete masonry units as it descends to the floor, while steam coming out of a series of smaller orifices at the floor has a high moisture condensation factor and this condensation reduces the moisture that should be deposited on the concrete.

With the pressure having been determined to give required steam velocity to create circulation within the

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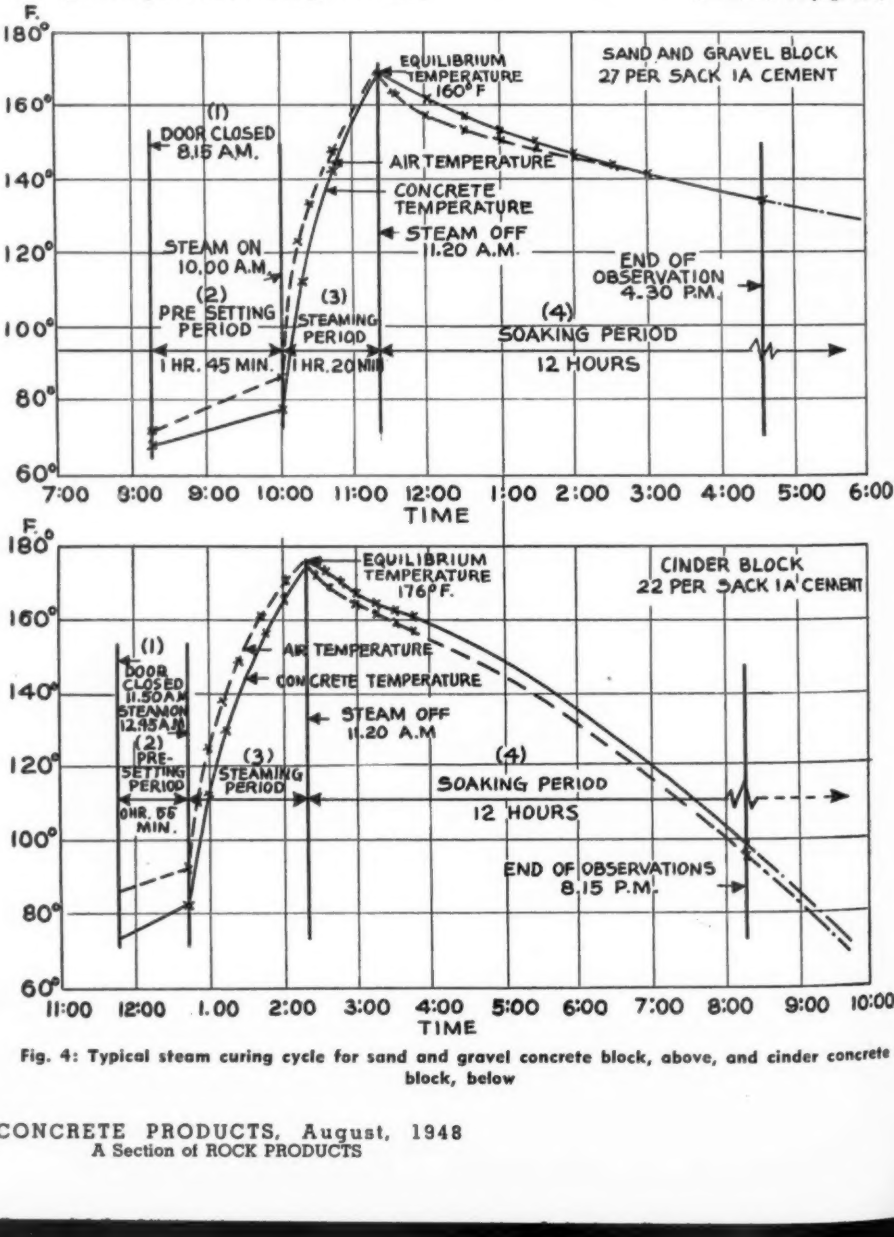
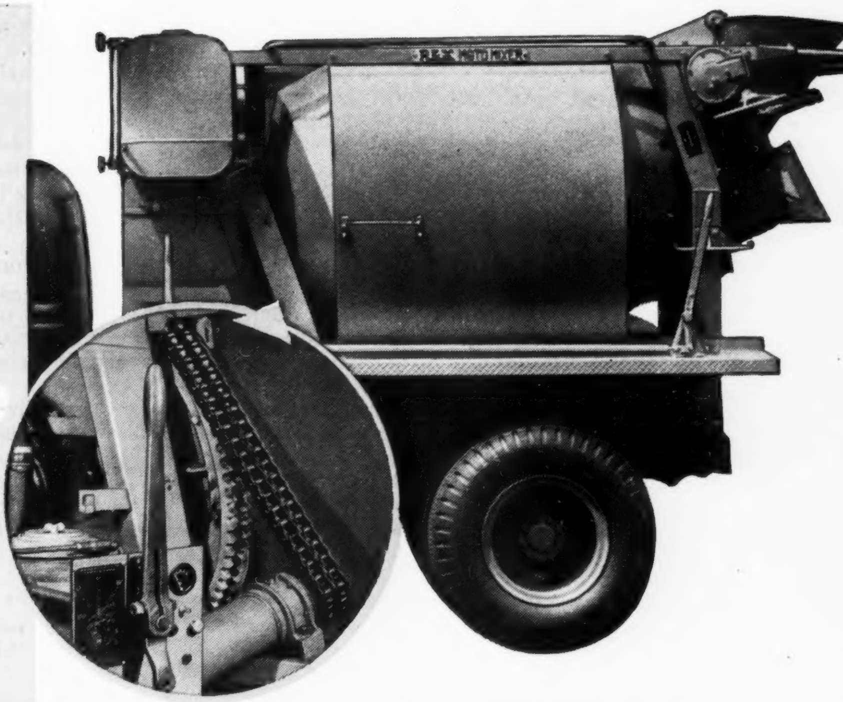
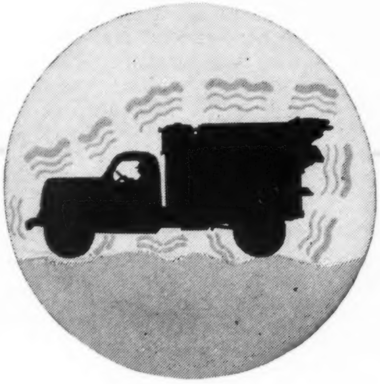


Fig. 4: Typical steam curing cycle for sand and gravel concrete block, above, and cinder concrete block, below

What the REX Chain Drum Drive Means to You!

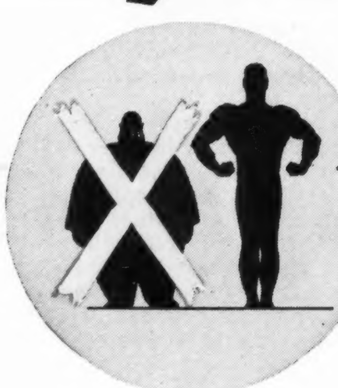


NO STRAIN WITH CHAIN



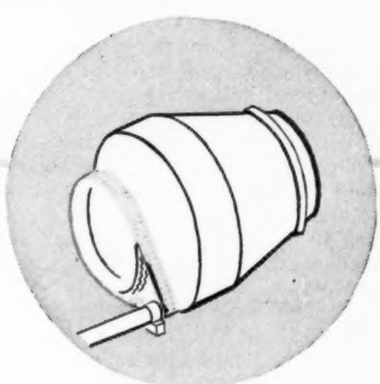
Eliminates Binding...... Accommodates Misalignments

Truck mixers are subjected to severe twists and strains as the truck weaves over rough roads. To protect transmission, gears, shafting, power plant . . . to prevent destructive binding action between drum and transmission, Rex Moto-Mixers employ the exclusive chain drum drive. This flexible drive absorbs the shocks and accommodates the *unavoidable* misalignments to which all truck mixers are subjected.



Permits Proper Weight Distribution

Thanks to the Rex Chain Drum Drive, weight can be correctly distributed in Rex Moto-Mixers. There is no need for excessively heavy frames and transmission cases or complicated transmissions, to overcome the effects of misalignment and strains. And weight saved here can be properly distributed to parts where it is needed most . . . bearings, shafting, blades, drum rollers, drum shell, drum supports.



Provides a Uniform Application of Power

The Rex Chain Drum Drive wraps more than halfway around the drum sprocket and more than one-third around the drive pinion to provide a uniform application of positive power. This positive power is applied to the drum over many sprocket teeth. Contrast this design to the gear drives of other truck mixers where the point of contact between drum gear and drive pinion is concentrated on a single gear tooth.

LONGEST LIFE . . . LOWEST MAINTENANCE . . . MORE PROFIT FOR YOU!

Have your Rex Distributor show you how the Chain Drum Drive means more profit to you. Chain Belt Company, 1649 West Bruce Street, Milwaukee 4, Wis.

CHAIN BELT REX COMPANY . . . CONSTRUCTION MACHINERY

kiln, the system is ready to steam cure.

Curing Cycle

The proper curing cycle, graphically shown in Fig. 4 is as follows: (1) The kiln is charged and the door closed. (2) The blocks remain in the kiln in a static condition from one to 2½ hours. This is called the pre-setting period, the length of time determined from the initial temperature of the concrete and the kiln, the type of aggregates, and the type of cement—Portland, air-entraining, or high-early. (3) At the conclusion of the pre-setting period, the steam enters the kiln with the valve wide open and remains on in the assumed kiln until the predetermined temperature is reached. This period is determined by design and proved by test for the kilns in each particular plant because the size and shape of the kiln and the load within are the governing factors. (4) At the conclusion of the established steaming period, the valve is shut off and remains off for the balance of the curing cycle. This is what can be called the soaking period and the length of time required is usually governed by the number of kilns available, bearing in mind that the longer the blocks remain in the soaking period, the more favorable will be the ultimate results. In no case, however, should the entire curing cycle be less than 15 hours from the time door is closed after charging the kiln until finally opened for stripping following the soaking period. (5) A drying period can be added to follow the soaking period to reduce the moisture content of the masonry units to acceptable standards. Here again the question arises as to the most economical and efficient method to use. Possibly a consideration of the factors involved in drying masonry units will be of help in designing an effective method.

The use of heat over and above the heat contained in the kiln and the velocity of the air passing through or being circulated in a kiln requires detailed study and design.

When the masonry units are very wet as is the case at the end of the soaking period, the passage of air over the units causes evaporation of the surface water and continues to evaporate surface water at a constant rate as long as the water in the masonry units comes to the surface so rapidly that the surface remains thoroughly wet. The constant rate period continues until the moisture no longer comes to the surface as fast as it is evaporated and this point is called the critical moisture content in the drying process.

During the constant rate period it is essential that the velocity of the air stream be such that the surface moisture will not be removed at a rate greater than the movement of the water from within the concrete to the surface.

As the drying proceeds the surfaces of the masonry units gradually dry out and the moisture removal decreases at a uniformly falling rate as the wet surfaces decrease in area.

When the surfaces are completely dry the water in the interior evaporates and comes to the surface as a vapor. As the plane of the water recedes the diffusion of the vapor becomes more difficult and the drying is at a varying falling rate. This is the sub-surface drying period.

Drying ceases at the equilibrium moisture content and this point is reached when the vapor pressure of the moisture within the masonry units and the vapor pressure of the moisture in the air are equal.

Additional heat to raise the passing air temperature will decrease the viscosity of the water which will increase the drying rate. Too high a drying temperature, however, cannot be used because temperatures in excess of 221 deg. F. will cause a loss of some of the chemically combined water and this is destructive to the masonry unit. Use of heated air, excessive air stream velocities or both can cause too rapid drying of the surface moisture to effect a case-hardened surface. This case-hardened skin retards the flow of moisture from the interior to the surface and will greatly increase the drying time.

In designing a drying system the thermodynamic properties of moist air (Fig. 1) again must be considered. To remove moisture from a masonry unit efficiently the vapor pressure of the moisture within the concrete must be higher than the vapor pressure of the surrounding air or in other words the relative humidity of the air must be sufficiently low to accept water from the masonry unit surface by evaporation. If a closed system is used for drying with air being circulated through insulated duct members the use of additional heat will not cause any appreciable moisture removal. Supposing the air temperature within the kiln is 120 deg. F., the moisture capacity of this air is 0.081 lb. per lb. of dry air and raising the kiln air temperature to 200 deg. raises the moisture capacity to 2.261 lbs. per lb. of dry air. The volumes, however, that these two saturated air conditions will occupy are 16.50 and 76.99 cu. ft. per pound of dry air for 120 and 200 deg. respectively. A 2000 cu. ft. free air space kiln will hold 113 lbs. of moisture in the kiln air at 120 deg. but only 61 lbs. of moisture at 200 deg. In a tightly closed circuit with an insulated duct system, the higher air temperature will retard moisture removal from the masonry units.

To dry the masonry units effectively the kiln must be ventilated to permit exhausting of the moist laden air or provision must be made in a circulating system to remove the moisture. This latter can be accomplished in two ways; by use of dessicants or by circulating the moist laden air through non-insulated duct members on the roof of the kiln. As long as the duct surface temperature is at or below the dewpoint temperature of the moist laden air passing through the duct, moisture will be deposited as free water within the duct members. Drainage holes in the duct will permit the condensed moisture to escape.

Effective drying can be obtained also by passing air from outside the kiln over the masonry units and then exhausting to the atmosphere. By this method the moisture content of the concrete can be reduced to a condition of equilibrium with the relative humidity of the atmospheric air in a relatively short period of time. Further reduction of the moisture content then can be effected by applying heat to the passing air. The application of heat prior to the equilibrium condition might cause a retardation of the drying and in any event it would be an unnecessary expense.

This concludes the live steam curing cycle and it would probably be of interest to examine the facts that established the curing procedure.

It was found necessary to pre-set the masonry units because a high velocity steam entering a kiln immediately following the placing of the last rack caused a hardening of the concrete before the concrete attained its initial normal shrinkage, with the result that shrinkage cracks developed.

The length of the steaming period following the properly established pre-setting period is determined by an end point that can be described as the equilibrium temperature. This is the temperature at which the concrete masonry and the kiln air are equal. The equilibrium temperature varies somewhat because the kiln charge and shape as well as the type of aggregates are factors in reaching the end point temperatures. Consider the steam entering the kiln at velocities in excess of 40,000 ft. per minute which causes a rapid temperature rise within the kiln. The temperature rise of the masonry unit, however, will lag behind the kiln air and this differential in temperature effects a dew point on the masonry unit with the result that moisture is added to the concrete. This condition is highly desirable because, as discussed previously, the concrete block mix usually does not contain the desirable minimum quantity of water to produce the normal products of hydration in Portland cement. The concrete will continue to take on moisture as long as the concrete temperature is at or below the dew point temperature of the air in the kiln, but as soon as the temperatures are equal, then the concrete will lose moisture and continue to lose as long as the steam remains on and this loss of moisture will be accelerated as the concrete temperature becomes increasingly higher than the kiln air temperature. Humidity conditions have been measured in a kiln during the steaming period and readings as low as thirty percent have been recorded, which proves that humidity need not be considered as a factor during steaming

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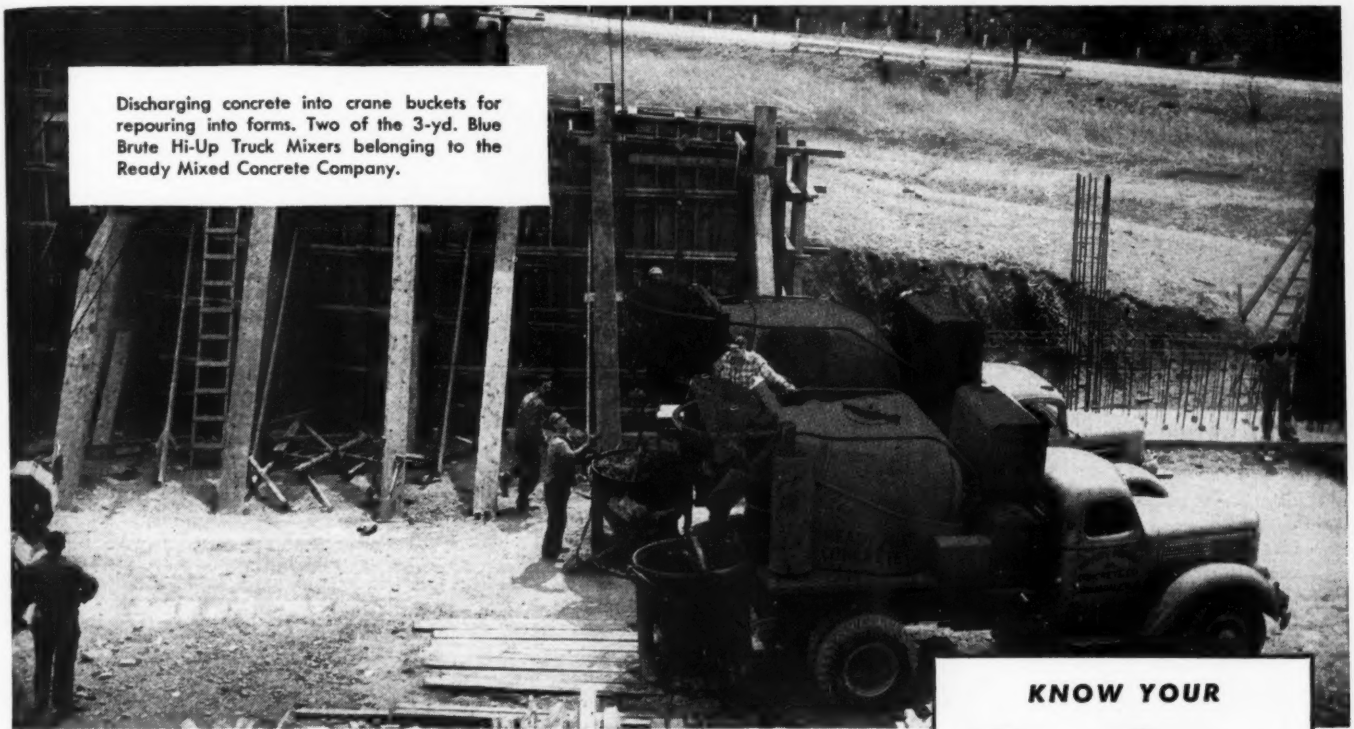
HI-UPS HELP BUILD THE NATION'S HIGHWAYS



Discharging concrete into crane buckets for repouring into forms. Two of the 3-yd. Blue Brute Hi-Up Truck Mixers belonging to the Ready Mixed Concrete Company.

In every section of the country Blue Brute Hi-Up Truck Mixers are playing an important part in much needed highway construction. At Clinton Point, N. J., for example, these Blue Brutes are at work on a highway underpass and bridge on Route 28.

Owned by the Ready Mixed Concrete Company of Annandale, N. J., the Hi-Ups are carrying a total of approximately 5,000 cu. yds. of concrete to complete this job . . . and providing efficient, economical transport mixing with features like the following:

Ransome's exclusive mixing action . . . quick-charging hopper with non-jamming sealing door . . . simplified, trouble-free water system . . . simplicity of design with working parts easily accessible . . . and engineered flexibility that eliminates working strains.

Proved ability to mix better concrete at lower cost has made Blue Brutes familiar sights on highway and other big construction jobs of every type. It will pay you to learn how these Blue Brutes can help *you* save money and beat schedules. Get the whole story from your nearby Worthington-Ransome Distributor, or write for Bulletin 221.

R8-2

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

RANSOME EQUIPMENT

Pavers, Portable and Stationary Mixers, Truck Mixers, and Accessories.

WORTHINGTON EQUIPMENT

Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

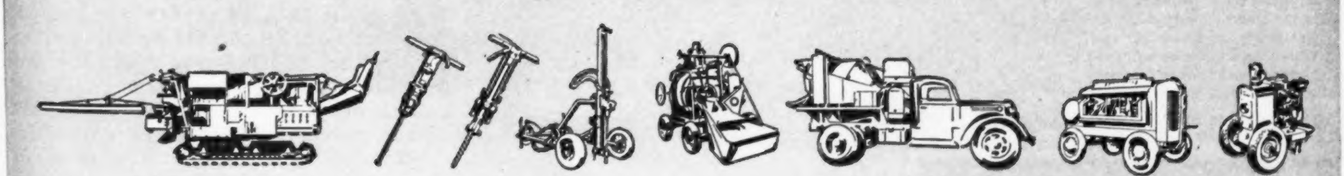
WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

Distributors in all principal cities

NATIONAL READY MIXED NRMCA CONCRETE ASSOCIATION

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

NEW MACHINERY

Lift Truck Line Addition

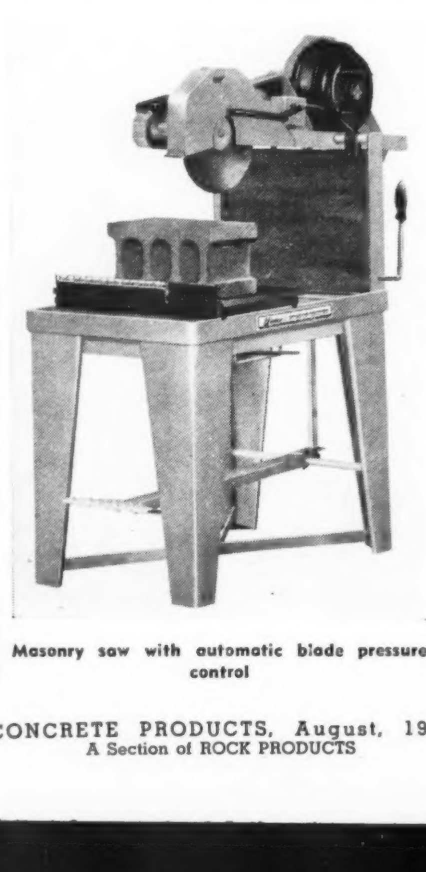
TRUCK-MAN, INC., Jackson, Mich., has added a pallet lift truck to its line of material handling machinery

Pallet-type lift truck, powered by 3 hp. air-cooled engine

to be designated the model "DF." Ratio of truck weight, 920 lb., to pay load capacity, 3000 lb. maximum, is an important economy feature in overall operation, according to the manufacturer. Feature of this model, as in other lift trucks produced by the same company, is its pneumatic tired "power turret," with an air-cooled Wisconsin 3 hp. gasoline motor supported over the fully-revolving drive wheels, a feature that permits turning in its own length.

Masonry Saw

VICTOR ENGINEERING CO., Philadelphia, Penn., is now ready to introduce the "Feedmatic" masonry saw to the trade, with its automatic, controlled blade pressure. Other features of this saw in addition to the blade pressure control, according to the manufacturer, is a wobble-proof carriage; positive head-lock; lever-operated, variable height control for different block; and a skid-proof foot pedal. Length of the unit is 54-in.; width, 25-in.; and height, 66-in. This saw makes a maximum cut of 5-in. and weighs 350 lbs.



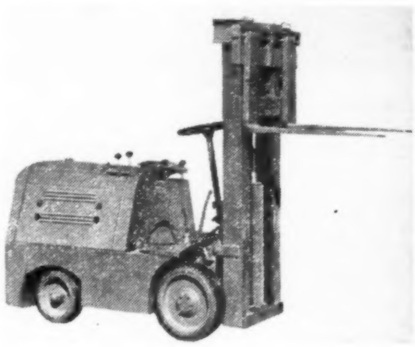
Masonry saw with automatic blade pressure control

Increase Electric Fork Truck Efficiency

CLARK TRUCTRACTOR DIVISION, Clark Equipment Co., Buchanan, Mich., has recently developed a foot control pedal for control of speeds on all Clark electric battery-powered fork trucks. The new foot pedal is placed for left-foot operation, with the driver's right foot operating the brake pedal. Brake operation automatically cuts off power from the battery in all but low gear, which speed is used for inching.

Add to Tractor Line

W. F. HEBARD & CO., Chicago, Ill., has recently added a heavy-duty fork lift truck, the F-50 Mulift, to its line of Shop Mule industrial tractors. Powered by an International Harvester gasoline engine, the new truck can raise a load of 5000 lb. to a height of 110-in. Capable of speeds up to 11 m.p.h., the loaded lift can be raised at a rate of 30-ft. per min. The extension lift-mast, controlled by hydraulic cylinders, can be tilted 3 degrees forward or 10 degrees backward.



Heavy duty fork lift-truck with a capacity of 5000 lb.

Detergent Lubricating Oil

GULF OIL CORPORATION, Pittsburgh, Penn., has announced the development of a detergent lubricating oil for automotive Diesel engines and for gasoline engines operating in heavy duty service. This product, named Gulflube H.D. Motor oil, has a paraffin base, which is said to give a particularly strong oil film, providing superior lubrication under severe operating conditions. The full detergent characteristic of the oil assures cleaner engines, and prevents deposits and ring sticking due to oxidation. It also has a patented anti-foam agent which is claimed to prevent crankcase foaming under severe temperatures and high speeds.

FIG. 5: COMPARATIVE STRENGTH STUDY OF STEAM APPLICATION METHODS

Kiln		1	2	3	4	5
Maximum Temperature		199	170	170	140	140
Steaming Time		2 hrs.	1 hr. 25 min.	12 hrs.	12 hrs.	0. hr 35 min.
Age	Specimen Number	Compressive Strengths 8" x 8" x 16" Units				
28 hrs.	1-1	866	1420	692	413	916
	1-4	821	1279	573	463	849
	1-6	681	1285	531	390	560
	Average	789	1328	599	422	775
7 days	1-1	1015	1695	1033	741	1366
	1-4	1162	1559	768	629	1248
	1-6	1149	1938	797	803	1309
	Average	1109	1731	866	724	1308
28 days	1-1	—	1714	1191	821	1465
	1-4	—	1700	1100	966	1454
	1-6	—	1911	989	1024	1420
	Average	—*	1775	1093	937	1446

* 28 day specimens of Kiln No. 1 lost in yard storage

as long as dry saturated steam enters the kiln at a rate to produce kiln air temperature uniform from ceiling to floor in all points of the kiln and a differential in temperature between the concrete and the kiln air is effected to cause wetting of the concrete.

The soaking period is as important a phase of the curing cycle as the steaming period. As the kiln air temperature decreases, the humidity condition then becomes a factor because the kiln, racks, pallets, and concrete are thoroughly saturated with moisture. As long as the air within the kiln is not disturbed by changing, the humidity of the kiln air increases as the temperature decreases because the moisture content is relatively constant. An accelerated curing condition is maintained in the kiln during the entire time that the temperature is falling to 70 deg. F., and, therefore, the longer the soaking period is extended, the more advantage is taken of a favorable curing condition and, naturally, the better will be the ultimate product.

Next, a brief review can be made of a series of tests that were cooperatively conducted at the Wm. Moors Concrete Products plant by the producer, the Concrete Curing Corporation and the Huron Portland Cement Company to prove or disprove the effectiveness of the live steam curing system. A detailed description of the tests is contained in an article "Curing—More Efficient Methods Determined by Tests" that appeared in the February 1947 issue of ROCK PRODUCTS. Five identical kilns of a capacity and size previously discussed were used with sand and gravel blocks made at a yield of 27 per sack of air entraining cement. Each kiln had an elapsed curing time of 15 hours from the time the doors were closed until finally opened for stripping. Each kiln was permitted to pre-set approximately two hours before steaming. In Kiln No. 1 the steam was on until the kiln temperature reached 199 deg., when the steam was shut off and remained off. Kiln No. 2 followed the live steam curing system method with the steam off at equilibrium temperature which in this case was 170 deg. F. Kiln No. 3 was steamed to 170 deg. F and intermittently turned off and on to maintain 170 deg. for balance of 15-hr. cycle. Kiln No. 4 followed same pattern as Kiln No. 3 but at 140 deg. F. Kiln No. 5 was steamed to 140 deg. when the steam was shut off and remained off. This last cycle followed the live steam curing system except that the peak temperature was well below the equilibrium temperature.

The center concrete block samples were selected from the top, fourth, and bottom three block plain pallet from an identically located rack in each kiln and samples were tested by the City of Detroit Building Department according to standard specifications at 28 hours following charging of the kiln, seven days, and 28 days. The strength results as shown in Fig. 5 were clear-cut and unquestionably proved the live steam curing system's superiority. In Kiln No. 2, the system under question had strengths averaging 1328 p.s.i. at 28 hours for a steaming period of 1 hr. 25 min. Steaming to 199 deg. F. injured the cement as is evidenced by the 789 p.s.i. average strength for the same age in addition to a more costly method. *Continued* steaming at 170 deg. F., as in Kiln No. 3, resulted in an average of 599 p.s.i. at 28 hours, indicating still greater harm to the cement. *Continued* steaming *at* 140 deg. F. makes an interesting comparison with steaming *to* 140 deg. F., as the strengths in the latter method are 84 per cent higher as evidenced by the 422 p.s.i. strength as against the 775 average for 28 hour tests. The 7- and 28-day tests only confirm the conclusion that the live steam curing system is a highly efficient and economical method.

To substantiate the claim that water is added to the concrete, weight tests were made on a pallet suspended in the kiln. The tests proved that water was added at a rate better than 3 gal. per sack of cement. No doubt some of the weight increase represented water in the core holes of the

(Continued on page 222)

FIG. 6: ABSORPTION AND MOISTURE CONTENT TESTS

Masonry Unit	Specification	*A*	*B*	*C*
Absorption Lbs.perCu.Ft.	15 (Max.)	12.5	8.6	7.1
Moisture Content Percent	40 (Max.)	40	52	60
Moisture Content Lbs.perCu.Ft.	6.0 (Max.)	4.80	4.47	4.26

block, on the pallet, and on the assembly, but liberal deductions for this moisture would not materially influence the conclusion that a very desirable and generous increase in water was maintained. This is believed to be the most important factor in the mechanics of live steam curing. Economically, this system has proved highly efficient as evidenced by average fuel costs of approximately one mill per eight-inch equivalent at the various plants using the live steam system.

If this method is considered of value and there is a desire to install it, then caution must be used to employ someone who is thoroughly familiar with steam and its properties. The installation is simplicity itself but too often steam curing is considered a problem in heating, whereas it is strictly a thermodynamic problem of heat and moisture, in other words, a process. It would be hazardous to specify here the boiler size, the operating pressure, and the size of the steam lines because each plant is an individual problem. The design of the steam system is influenced by a number of factors, some of which are: size and shape of the kiln, conductivity as determined from the kiln construction, type of aggregate, type of cement, yield per sack of cement, weight of the block, blocks per kiln, and so on, each of which must be considered in the design.

The live steam curing system is a small contribution to the furtherance of concrete masonry as a stable building material. There is much to be done, however, on continuing the study of curing and the concrete masonry end products. Such studies should include kiln construction with particular emphasis on metal kilns or metal lined kilns to eliminate moisture losses through walls and ceiling. The expansion and contraction as influenced by temperature and moisture changes of present day cured masonry units should be analyzed as related to the degree of cement hydrated.

The present standard specifications for concrete masonry building units apparently contain an unintentional penalty to the quality producer. This is in reference to the specification clause on absorption and moisture content because the absorption is expressed in pounds per cubic foot of concrete while the moisture content is expressed in percent of the absorption of the particular unit being tested. It appears that both absorption and moisture content should be expressed in pounds per cubic foot of concrete with the maximum moisture content limit established to insure minimum shrinkage on further drying out of the masonry unit. Fig. 6 contains three tests for absorption and moisture content. Masonry unit *A* has the highest absorption but it meets both the moisture content and absorption specifications, while masonry units *B* and *C* fail to meet the moisture content requirement although the absorption and the actual moisture carried is be-

(Continued on page 224)

Just over 2¢ per block IS OUR LABOR COST ON

Idaho Masonry Products Company
1390 Highland Avenue • Telephone 197-J
Twin Falls, Idaho

April 5, 1948

Lith-I-Bar Company
Holland, Michigan

Attention: F. E. Milewski, Pres.

Gentlemen:

This is in reply to your recent letter requesting production and cost figures on the Lith-I-Block machine we purchased a year ago this month.

At that time we realized that we had to have a plain pallet machine that would produce a quality unit on an equal cost basis to other more costly equipment operating in this territory.

We believe that our constantly increasing sales volume is due to our ability to use our pumice aggregate in your machine with far greater water content, resulting in units that are uniformly dense, accurate in all dimensions, and with more than adequate strength at an economical cement ratio - the resulting eye appeal substantially helping our sales.

In arriving at our labor costs we include all labor required from the time the raw material arrives via rail to the finished product loaded on outgoing trucks. We also include clean up and all equipment maintenance time in the following figure.

The total direct labor cost charged against manufacture is $20.16 per thousand 8" x 8" x 16" units or equivalents.

We might add that we are very happy with our Lith-I-Block machine in every respect, and we take this opportunity to thank you for the splendid cooperation and service that your company has extended. When our sales warrant it we would not hesitate a moment to purchase a second Lith-I-Block machine.

Yours very truly,

IDAHO MASONRY PRODUCTS COMPANY

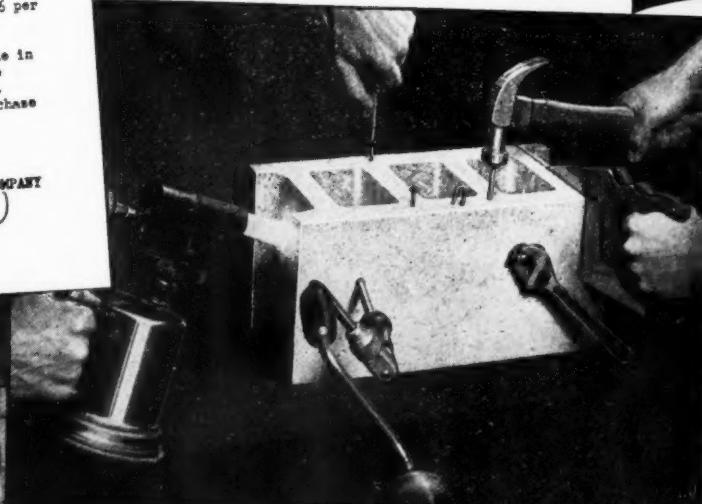
W. L. Reiher

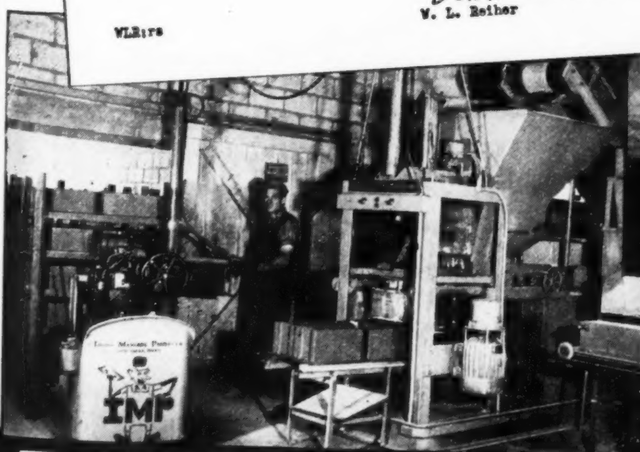
W. L. Reiher

WLR:rs

LITH-I-BLOCK MACHINE rated capacity 480—8" blocks per hour. Advantages include plain pallets for all sizes of block, brick, chimney units and tile—quiet operation—continually clean pallets—quick, easy size changes—automatic pallet feed—instantly adjustable feed timing—offbearing cycle reduce to ½ of production cycle—simple installation.

PUMICE BLOCK ON LITH-I-BLOCK MACHINE





LITH-I-BAR COMPANY

DEP'T. 60 HOLLAND, MICH.

low that of masonry unit A. Certainly the tests for units B and C indicate better products because they contain less moisture, and it is the loss of this moisture that causes the shrinkage of the masonry unit. If the specification limited the moisture to 4.5 pounds per cubic foot of concrete, which is equivalent to 30 percent of the maximum allowable absorption, such specifications would be more equitable and would eliminate presently used inferior products. It must be remembered that the lower the absorption the more difficult it will be to reduce the moisture content because the lower the absorption of the concrete, the smaller will be the capillaries in the concrete and naturally the greater will be the force required to remove the moisture. We can conceive a masonry unit of excellent absorption properties that could not possibly meet the present moisture content specifications unless subjected to an expensive drying cycle. The method of drying would tend to injure the cement, and instead of improving the product would do the exact opposite.

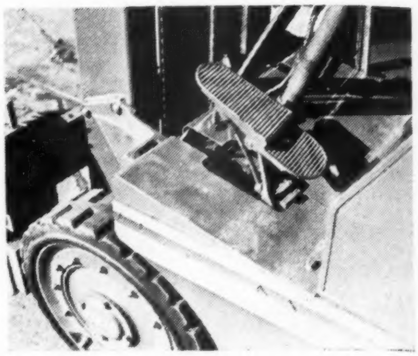
It is the intent of this article to generate serious study of the high temperature atmospheric pressure curing problem by the concrete masonry industry. This will be necessary to firmly establish concrete masonry as a preferred building material, a position that it can and should possess.

Committee Revisions On Masonry Units

COMMITTEE C-15 on Manufactured Masonry Units, American Society for Testing Materials, has announced organization of three new subcommittees covering acid-resistant brick, flue linings, and drain tile, respectively. Actions taken also included recommendation for advancement to standard of Specification for Vitrified Clay Filter Block for Trickling Filters; continuance as tentative of Specification for Glazed Masonry Units; revision of the three specifications on concrete masonry units; revision of the Specification for Facing Brick covering the surface coloring to be applied to a brick; and a revision of the Specification for Building Brick which will place the footnote covering the strength requirements for four grades of brick into the specification itself. Three new materials are to be studied from the standpoint of standardized specification requirements; namely, adobe, pumice and perlite.

Fork Truck Pusher

CLARK EQUIPMENT CO., Trucktractor Division, Battle Creek, Mich., announces a new simplified pusher device for use with company-manufactured fork lift trucks. It is stated that more efficient hydraulic operation and rugged construction with de-



Hydraulically controlled pusher for off-loading fork trucks

creased weight are features of the new design. Moving horizontally, the device moves material off the forks at any desired height. Two equalized hydraulic cylinders, supported on two horizontal slide channels mounted on roller bearings, provide power to push the load a distance of 55½-in.

COUP'S CONCRETE PRODUCTS CO., Cambridge Springs, Penn., has started the manufacture of concrete block, Clarence Coup, owner of the firm, reports. Plant capacity is 1200 block per day, with two types being produced: sand and gravel block and slaglite block.

MISSOURI BUILDERS' SUPPLY CO. has been opened by W. M. Clinkscales at Boonville, Mo., for the manufacture of ready mixed concrete.

Palletizing Block

(Continued from page 207)

and wooden pallet are lifted onto the back end of the dump truck. The fork of the Clark lift truck is then maneuvered so that the entire cube is pushed to the front of the truck and the operation is repeated until the loading is completed. The wooden pallet acts as a skid and readily slides on the metal bottom of the dump truck. A time-check showed the loading of 360 blocks (six cubes) onto a flat rack truck took about five minutes.

Six kilns are used for curing sand and gravel aggregate blocks, cinder, and Waylite masonry units. For preparing cinders, a Buffalo hammermill is operated in closed circuit with a Seco vibrating screen and bucket elevator. A Bisonette boiler supplies the steam for the kilns. Sacked cement is used.

The plant operates very efficiently from the office through the production line. Mr. Kiphuth handles all the company office and supervisory business with the advice of Mr. Sylvester J. Linton, and in the plant is a working foreman so there is no lost motion or excessive overhead any place in the organization. Mr. Linton and Mr. Kiphuth have worked out a smooth and efficient system of office and plant planning, so that while quite busy, the business functions in a healthy manner.

The plant is located at Tonawanda, New York, a suburb of Buffalo. S. J. Linton is sole owner of the company.

Diversified Products

(Continued from page 206)

When the steam pressure falls below the prescribed pressure the oil burner automatically starts and remains burning until the pressure is back up. The saving in oil on this type of equipment is surprising for at this operation it was said that 600 gal. per *month* was all that was required. A No. 3 oil is used although No. 5 is recommended. The fire box is provided with pre-heater coils for the oil.

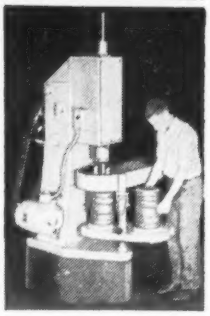
Bulk cement is stored in a main silo holding 668 bbl. and a service steel bin of 90-bbl. capacity. Two elevators are provided, one for the aggregate and one for the cement. This equipment was supplied by C. S. Johnson Co. Aggregate is delivered to the plant over the Seaboard Air Lines Railroad, and dumped from an elevated trestle to ground storage where the material is picked up by a 1-cu. yd. Hough Payloader that delivers the aggregate to the boot of the bucket elevator serving the aggregate 4-compartment bin over the batcher. Additional ground storage space is contemplated. The shop for repair purposes is being built on the roof of one of the plant buildings.

•

EWALT CONCRETE PRODUCTS is building a new plant at St. Peter, Minn., for the manufacture of six sizes of drainage tile, Gilbert Ewalt, owner, has announced. Other lines of tile and concrete products will be added later.

CEMENT TILE

Today's Big Manufacturing Opportunity

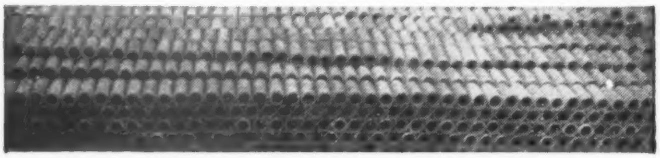


The market for drain tile is HUGE. Demand is increasing much faster than supply. Farmers urgently need it to increase soil fertility and crop productivity . . . and have the money to buy. More cement tile plants are needed—badly—throughout the country.

Besides farm drainage, other projects require millions of cement tile. Home building . . . road construction . . . sub-division development . . . and many others.

Manufacturing is easy. Market opportunities are unlimited. Profits are generous. Champion Drain Tile Machine makes the finest tile ever developed—strong, dense, true. Better than clay tile, yet can be sold for less. Made in local plants, of local materials, by local labor, for local market. Requires only a moderate investment. Write for full details.

Concrete Equipment Co. 560 Ottawa Avenue, Holland, Michigan



Economical **LANSCO** Attractive

CEMENT COLORS

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COLORING

BLOCKS, BRICK, TILE, CEMENT FLOORS, READY MIXED CONCRETE AND ALL CONCRETE PRODUCTS.
WRITE FOR COLOR SAMPLES AND PRICES.

LANDERS-SEGAL COLOR CO.

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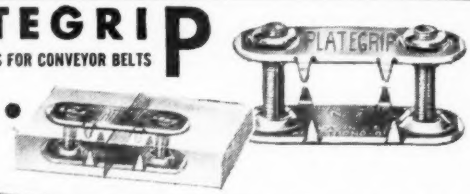
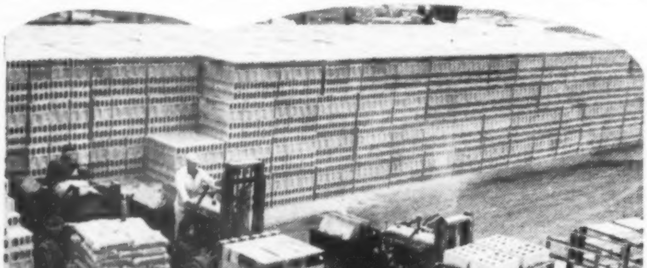
PLATEGRIP

PLATE FASTENERS FOR CONVEYOR BELTS



Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from 1/4" to 1 1/2" thickness. *Write for Catalog Sheet.*

ARMSTRONG BRAY & CO.
5366 Northwest Highway, CHICAGO 30, U. S. A.



5 Ericksons

Now Owned by Gage Bros

We quote from a letter to us by Gage Bros. Concrete Products Co., Inc., Sioux Falls and Aberdeen, S. D. "After coming back from our Aberdeen plant I can't say enough good about our two new Erickson high-lift trucks, making five we have purchased. For maneuverability, sturdiness and performance over almost any type of yard I don't see how anyone can afford to be without one in a concrete block plant. Everything is in a neat pile, we save a lot of yard space and much confusion. Inventories are a snap to take now, all we do is check the number of cubes."

Write for Literature

Erickson SPECIAL EQUIPMENT MFG CO.
1405 MARSHALL ST. N. E. • MINNEAPOLIS 13, MINNESOTA

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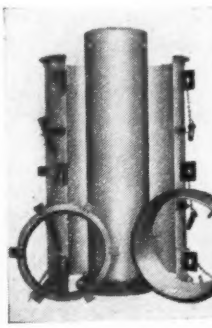
FOR CONCRETE PIPE

Whether it is concrete pipe for sewers, culverts, drains, irrigation or other purposes, installed under normal or unusual conditions, be sure to let us show you what ATLAS SPEED FORMS can do to save time and money in production.

Rugged reinforced steel and welded steel fittings—all parts heavily built to stand the "racket," yet providing fast and easy operation, both in setting up, filling and removal of pipe. No clamps, hooks or gadgets to fuss with—nothing to get out of order.



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CONCRETE FORMS CORPORATION
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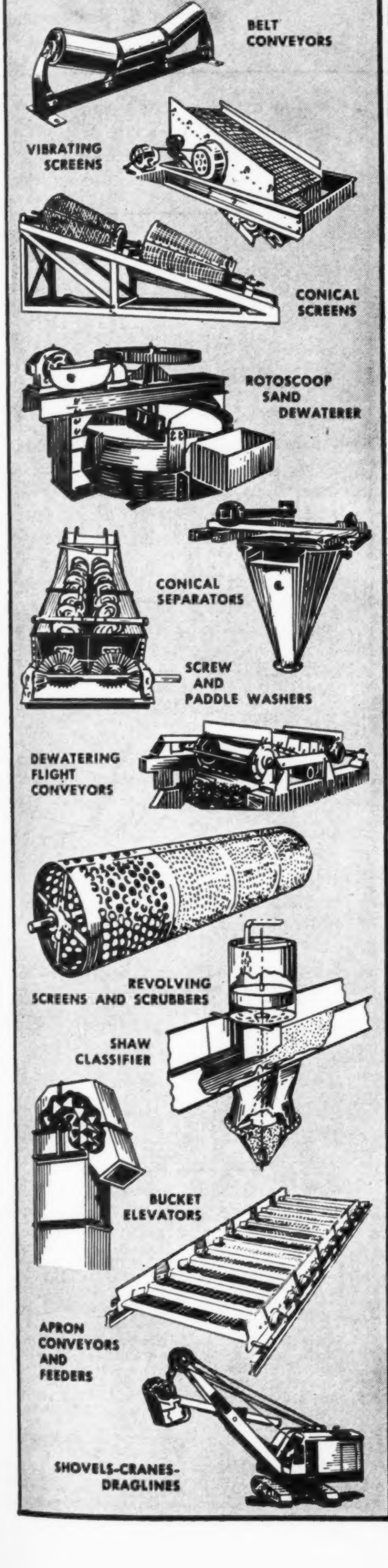
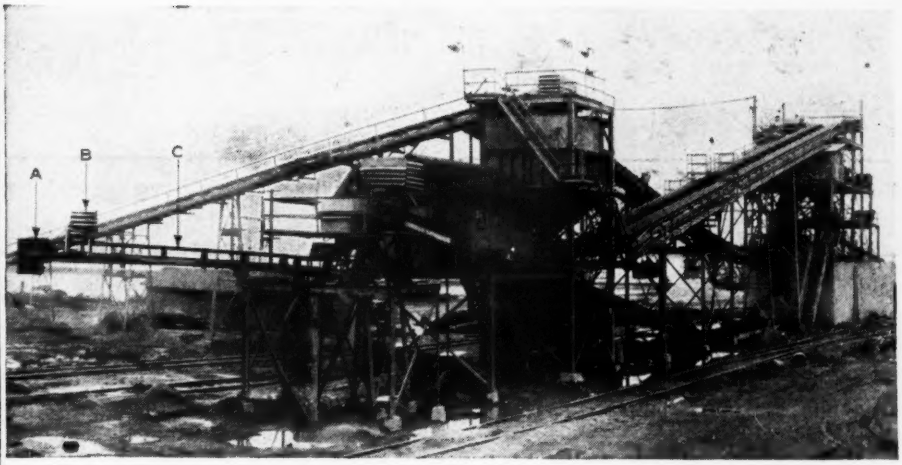
LINK-BELT CONVEYORS AND PREPARATION EQUIPMENT





Link-Belt Conveyor System cuts handling costs at Sangravl

The new plant of Sangravl Company, Inc. at Johnsonville, Tenn., a subsidiary of T. H. Herbert & Sons, located at 174 Third Avenue, North, Nashville, Tennessee, features an extensive Link-Belt belt conveyor system, for low-cost handling, high capacity and flexibility. All material transfer is by belt conveyor, with the steepest pitch being 14 degrees plus.

Dredged material is handled by conveyor shown at the left in top picture. This inclines up from gravel barge delivery dock with 60-ton surge hopper, upper center. House containing automatic conveyor belt scale is at center; screening and crushing station over five concrete bins is at right. (A) shows deflector baffle on end of carloader; (B) carloader motor cover; (C) conveyor on carloader. The carloader is arranged to swing over either track.

Talk over your problems with a Link-Belt engineer, whether you are interested in a new plant or equipment for modernization of present layout

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

At right: Close-up of carloader belt conveyor.

11,188

LINK-BELT

Conveying & Preparation Machinery